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SCIENCE AND TECHNOLOGY

No. 141

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FRANCE: 95 MF FOR BIOTECHNOLOGIES IN 1983, PLANS OUTLINED

Paris AFP SCIENCES in French 3 Feb 83 pp 1-3

[Text] Paris--On 31 January Jean-Pierre Chevenement announced that the government would spend 95 million francs this year on the mobilizing program "to stimulate the development of biotechnologies" in order to "place France among the leading nations in a field that is essential to our future."

The minister of research and industry had just attended the first meeting of the "national committee" working on these technologies. This committee is composed of about 30 people from the ministries of research and industry, health, agriculture, national education, and the budget, major research organizations such as the CNRS [National Center for Scientific Research], the INSERM [National Institute of Health and Medical Research], the INRA [French Institute for Agronomical Research], the CEA [Atomic Energy Commission], and the Pasteur Institute; the Academy of Sciences, the major nationalized industrial groups, banks, and unions. According to the minister, this committee will act as an actual parliament which will spur on the mobilizing program, and a politically-oriented forum in the field of biotechnologies.

According to Pierre Douzou, member of the Academy of Sciences and vice chairman of this committee, who was actively involved in preparing its program, the committee will get off to a fast start and, as was the case with electronics, lead to concrete achievements in about 20 years. France is somewhat behind in a number of fields, but not in all, and it is possible to catch up, "especially as clear and precise objectives have been defined."

France can not remain outside the field of biotechnologies. The world market for second generation bio-industries, that is, excluding the traditional fermentation industries, now amounts to nearly 140 billion francs. "Within 10 years, this market will reach the level of 250 billion," claimed Mr Chevenement. "France's share of this market is now 7.3 percent. Our goal is to reach 10 percent of the market within the next 10 years."

This reveals the importance of the "biological approach," and of mobilizing everyone involved--scientists, engineers, members of industry, bankers--in order to achieve this goal within this time period. The challenge is all the greater because the applications of the biological sciences are "broad, diversified, and complex." As the minister reminded his audience, the field of applications includes the pharmaceutical and chemical industries, along with agriculture, food processing, energy, raw materials, and the environment.

According to the plan, we should expect a strong growth in the pharmaceutical and immuno-industries, a sizeable growth for the food processing industry, a potentially strong growth in the areas of water treatment and energy. Plans for some other sectors still remain to be drawn up.

While some organizations have already been created (Immunotech by the Pasteur Institute, Hybridolab by the INRA), some transfers arranged and associations established, French industry is still hesitant because the biotechnologies, despite a number of patents filed, have hardly led to any finished products yet. Some projects are now under study. The major nationalized groups will be encouraged [part of line(s) missing]. Support will be offered to "venture capital" companies which have been founded or which will be established in the field of genetic engineering and the production of monoclonal antibodies.

Despite the competition beginning to appear all over the world, Mr Douzou said that there is at present a strong desire for bilateral cooperation agreements, between the European countries, with Canada and the province of Quebec, and even with Japan.

The minister added: "In this game which is just beginning, there will be winners and losers, and we must be among the winners." He then spoke of some of France's advantages in this "game":

"The first is our basic research. In our government laboratories we have over 5,000 scientists helping to make this research top-quality, high performance work." The minister spoke of the recent decisions made by public organizations such as the INSERM, the CNRS, and INRA, and the agreement between the CEA and the AFME [French Agency for the Mastery of Energy]. "All these are steps taken in the right direction," he added.

France's other advantage in this race for biotechnologies is "our dense and diversified industrial fabric."

"The work of the biotechnologies mission has shown the motivation of our industry and its desire to incorporate and make use of the new techniques arising from biology."

About 20 reports are allegedly under study now, but discretion is essential in this area, said Gilbert Durand, the committee's secretary general.

The major world-class French groups, both public or private, should get involved in biotechnologies. But it would be wise to "maintain a spirit of emulation and establish a certain degree of solidarity, especially in areas in which innovation entails the greatest risks," added Mr Chevenement.

These biotechnologies have issued to France "a scientific, technical, and industrial challenge," which led to the mobilizing program which was begun on 31 January.

The objectives of this program are:

a. First of all, mastery and improvement of the present technologies. Actions will be taken to bring about a strong revival in microbiology. Such actions will be taken this year by organizations such as the CNRS, the INRA, and the Pasteur Institute, in cooperation with industry. In addition, data banks and biological strain banks will be formed and access to these sources will be improved. A GIP [expansion unknown] consisting of four laboratories and representatives of industry is now being formed.

b. Then, preparation for the future. There will be a quasi-systematic inventory of the techniques now being created in laboratories, and new approaches will be explored. There will be research on new vectors and new receptor cells (the CNRS and INRA are to make a special effort on plant molecular biology at Strasbourg and Versailles). The results of basic research will be tested by use in a more applied approach, giving rise to and strengthening technological methods. Support will also be provided for companies using "venture capital."

c. Finally, these new technologies must be disseminated throughout the industrial and agronomic fabric of France.

The minister expressed his hopes that the national committee will organize working groups to handle a "technological watch." This will make it possible to maintain a constant updating of the program, its follow-through, and evaluation, to ensure financing, whether public or private, of research and development, to prepare for the training of specialists and labor to handle new careers in biotechnologies, and also to ensure international cooperation in this field.

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CSO: 3698/213

BRIEFS

ITALIAN GENETIC ENGINEERING PATENT--The first Italian patent in the field of genetic engineering has been issued to Assoreni, the research company of the state-owned ENI group. It concerns a new system which makes it possible to produce proteins using soil bacteria. [Text] [Duesseldorf EUROPA CHEMIE in German 28 Oct 82 p 518]

CSO: 3698/245

ERICSSON INFORMATION SYSTEMS SEES GOOD GROWTH PROSPECTS

Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 22 Sep 82 p 2

[Article: "The Company Is Incurably Healthy"]

> [Text] Luxembourg (njh). Business manager Benno Hilmer of Ericsson Information Systems GmbH in Duesseldorf characterized the Ericsson concern as "incurably healthy." As he continued before journalists in Luxembourg, he added that the company's good financial position and extensive experience, especially in the field of telecommunications, are outstanding foundations for realizing ambitious growth plans. Accordingly, he is expecting sales of over DM 60 million for 1982, which of course is less than planned; nonetheless, the growth rate will still amount to over 30 percent. In order to make even more attractive the already well-received Alfaskop Terminal, a four-color screen and a microcomputer version are being planned at Sicob. New market segments will also be opened up with a manufacturing control system.

Overall, Ericsson Information Systems AB, Stockholm, is already figuring on being in the black for 1982. As their president, Hakan Ledin, related at the same exhibition, sales have increased in the first half-year by about 12 percent to over a billion Swedish krone.

The company, which was formed out of Datasaab and two other company divisions, became a legally independent company at the beginning of the year. It has been able to hold the loss taken over from Datasaab at a much lower level than expected, 25 million Swedish Krone during the first 6 months, through strict cost controls and improved financial structure.

Ledin sees in the coalescense of telecommunications and data processing outstanding business prospects and wants to make his company into one of the leading offerors of integrated information systems by the end of the 1980s.

The firm is eyeing the German market in particular where it wants to realize above average growth rates. Target groups are medium-sized and large companies. This goal will be achieved through increasing the catalog of products, expanding the marketing organization and acquiring other companies.

Hilmer sees the beefing up of the personnel roster to 130 by the end of the year, the construction of a new headquarters in Duesseldorf and the planning of additional outlets as initial steps in this direction. He figures that many current orders which have not been called in either for business cycle reasons or because of foot dragging by labor council representatives can be serviced during the next 6 months. This delay in filling firm orders has led to the correction of projected sales.

In the product area, the firm has proposed to Sicob improving its Alfaskop Terminal. This involves for one thing a four-color terminal which in an expanded version can mix in three other colors. Further, additional symbol sets are offered with which the user can combine his own signs, symbols and graphics.

The versatile terminal is now offered as a microcomputer, the Alfaskop S 41. This recognized the trend for users to have computing power available at their work stations. It operates under UCSD-p, a universal operating system for which a great deal of software is available on the market.

By combining the manufacturing control system Mimer with the factory data acquisition system Centracom the feedback of production data is now possible.

[illegible]
CSO: 3698 [illegible]

ELECTRONICS

POLITICS SAID TO AFFECT THOMSON-CSF EUROTECHNIQUE DEAL

Paris ELECTRONIQUE ACTUALITES in French 21 Jan 82 pp 1, 17

[Article by J.-P. Della Mussia]

[Text] Following the desire expressed by the public authorities to have the number of French MOS centers reduced, Thomson-CSF [General Radio Company] announced last evening that a protocol of intention was signed last Tuesday by Thomson-CSF, Saint Gobain, National Semiconductor (NS), and the public authorities (represented by Mr Gallois, director general of industry), providing for the transfer of the shares held in Eurotechnique by St-Gobain (51 percent) and National Semiconductor (49 percent) to Thomson-CSF.

The participating parties reached agreement on the purchase from NS by Thomson-CSF of the licenses to produce all of the items currently in the Eurotechnique catalogue, and certain products which were scheduled to be added to the catalogue (including the NS microprocessor 16000 family).

Thus Eurotechnique will continue to receive the NS circuit shields, as in the past.

A technological agreement is moreover currently being negotiated, so that the future circuits developed by NS can be distributed at the Rousset factory, with installations compatible with those of NS.

Thus nothing will change in the short and medium time range for customers where products are concerned, as compared to the preceding situation. In the long run, however, the change will have extensive repercussions. The Eurotechnique products are in fact all in world use, and only a firm reputation and a powerful world sales network can lead to the production needed to achieve profitability, in view of Japanese growth. Without the rationalization of production and joint marketing with the NS, the second version of Eurotechnique runs the risk of moving toward the loss of a great deal of money, and over such a long period that Thomson-CSF will be forced sooner or later to change its product policy. Now the products involving the greatest loss will be the standard memory banks--these circuits precisely, along with microprocessors, are the focus of a desire on the part of the public authorities to correct the trade balance between now and 1986! We, for our part, believe that this agreement is a denial of the realities in the world of semiconductors, within the framework the goals of the government, and also that the public authorities will now be in a position to encounter again the problems they faced 15 years ago during the first Calculation Plan.

A Political Decision

Following our earlier articles explaining why, in our opinion, a simple take-over of Eurotechnique by Thomson-CSF offered more disadvantages than advantages (see ELECTRONIQUE ACTUALITES, 12 November 1982) and setting forth the main guidelines of the joint venture proposed by the NS (see ELECTRONIQUE ACTUALITES, 3 December 1982), we were able to reestablish why this joint venture, which continued to be the most attractive solution both to the users of the components, the taxpayers, the NS and the component activity of Thomson-CSF, was not realized.

At the beginning of July 1982, the main lines of an agreement leading to an association, rather than absorption, had already been drafted by the DIELI [Directorate for the Electronic and Data Processing Industries].

At that time, the management of Thomson-CSF wanted to take the matter in hand itself although, it must be admitted, this matter, formerly the responsibility of those in charge of the components branch, posed a problem for the company, leading as it did to the separation of the trade and commercial activities of Thomson-EFCIS with regard to integrated circuits (because the former has to do with Eurotechnique). The Thomson-CFS management then examined the situation from an overall viewpoint, not in the interests of the users of the French components but in the interest of Thomson-CSF, and above all the systems divisions of that company, which have always wanted to have the component divisions under their command (which is understandable, moreover, the important thing for the group's turnover volume being to produce the best possible systems). Now if the promotion activity is separate, the real production costs for the needs of the group would be clearly revealed, and it would have been necessary to settle the problems of subcontracting to Thomson/NS. The reaction of the Thomson-EFCIS personnel was also very negative concerning the prospect of separating promotion and commercial activities. Moreover, the contracts or subsidies of certain departments (on the part of the military, in particular) would have been granted only for the promotion portion.

Finally, Thomson-CSF has always been hostile toward a joint venture undertaking for integrated circuits, because the departments, French companies or research bodies (which contribute to innovation) have always given their contracts by preference to a company which is 100 percent French rather than one only 50 percent French.

This was paralleled by the arrival of Mr Chevenement's team at the Ministry of Industry in July. It did not take long for Mr Gomez (president of Thomson), who had a personal relationship with Mr Chevenement, to convince him that the proper solution was a 100 percent Thomson-CSF solution. As of the end of August, this proposal had official approval in very high circles. Despite the negative advice of electronics officials to Messrs Chevenement and Mauroy, and despite very keen opposition from the DIELI, which saw it as a step backward, nothing changed subsequently. The appointment of a new official in charge of components at Thomson-CSF, who had only to apply the principles already defined, was permitted, and NS was left unaware that it would be asked to withdraw. The real negotiations began in October. (Already, by that time, Eurotechnique was being harshly affected by the decline in long-term orders from some customers who were concerned about the fate of the company.) Coincidentally, the official in charge of the interministerial mission for components changed jobs at that time. Then, a few weeks ago, in an effort to preserve the orientation and the intellectual and human investment of Eurotechnique, the NS proposed to buy back the St-Gobain shares. (Beyond a material investment of about 12 million dollars, the NS had in fact invested much time in Eurotechnique, because it believed in that company and always esteemed both its personnel, its three present executives in particular, and its excellent production yields.) The Ministry of Research and Industry was unwilling. Since then, the negotiations have had to do with reimbursement by the NS and production licenses.

The Motorola Experience

The NS will doubtless emerge from this affair well enough off. Finally, its products will be accepted in France after all, since Eurotechnique will produce them on French soil. In addition, the experience with the Thomson-EFCIS links with Motorola and AMD showed that it was these two last mentioned companies which delivered quantities of their products in France, pending their production by Thomson-EFCIS, in general with a delay of at least one year, the introductory period during which market prices are the highest.

But let us not conclude on a pessimistic note, and let us not get into the matter of intention. The three present Eurotechnique executives have not to date submitted their resignations. Now it is in large part thanks to them that the company got under way, at a time when the NS had not yet proposed any commercial affiliation, and in which the opportunities of Eurotechnique were thus still limited. Perhaps, in addition, the second version of Eurotechnique will be left great freedom for commercial initiative. Perhaps the technological agreements being negotiated with the NS will go as far as research and development. After all, the world semiconductors industry is persuaded that this year will see a recovery. Thus the situation will be favorable to an important upsurge in sales and to fewer difficulties.

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CSO: [illegible]

SIEMENS STUDIES ARCHITECTURAL CONCEPTS FOR VLSI COMPONENTS

Bern TECHNISCHE RUNDSCHAU in German 9 Nov 82 pp 32-33

/Article based on papers given by Dr. Hans Friedrich, Dr. Dietrich Widmann, Dr. Gerd Sandweg and Dr. Otto Grüter on the occasion of a Siemens Technical Press Seminar on 30 September 1982 in Munich/

> /Text/ The tools for implementing very highly integrated semiconductor circuits are becoming more and more powerful. The laboratories are creating the technology, circuitry, architecture, and testing technology for VLSI circuits which combine more than 100,000 switching elements on one chip. Already in this decade, components with more than 1 million integrated transistors are expected. The rising demand for memories with larger capacity and faster access, as well as the requirement to integrate more and more complex systems for economic reasons, are the engines for the advance of VLSI technology.

VLSI Components Require Architecture Concepts That are Convenient for Design

VLSI components with more than 100,000 switching elements on one chip offer a very great processing power on a very small area. Their complexity requires suitable architecture concepts, which are distinguished by modularity and by regularity, and which primarily make possible a generally automatic design of the chip.

In the case of components with a considerable logical portion (microprocessors), architecture considerations are much more significant than in the case of memory components. Besides technological and circuit problems, the primary point is to solve complexity problems. These can be reduced by modularity and regularity, but this may involve a waste of surface area (and thus necessarily a lower yield). A modular build-up with regular structures currently is also the only feasible path for automating the design process.

The Siemens researchers verified their architecture considerations by constructing an experimental 32-bit arithmetic processor (see box). An important point for the design of such VLSI components is the close coupling of logical and geometric structurization (Figures 4 and 5). The designer must organize a component into blocks, in such a fashion that their surfaces and connections fit together, and thus the requirement for surface area, the wiring effort, and the running times are minimized. Separate optimization of individual functional blocks, on the other hand, is much less fruitful.

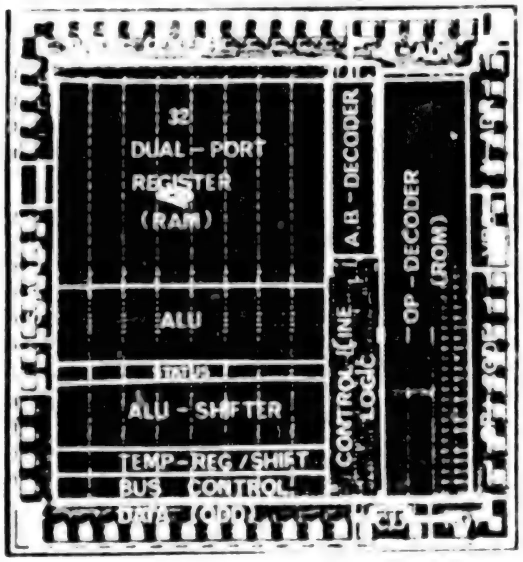


Figure 4a: The Experimental 32-bit Arithmetic Processor Combines 25,000 Switching Elements on 17 mm^2.

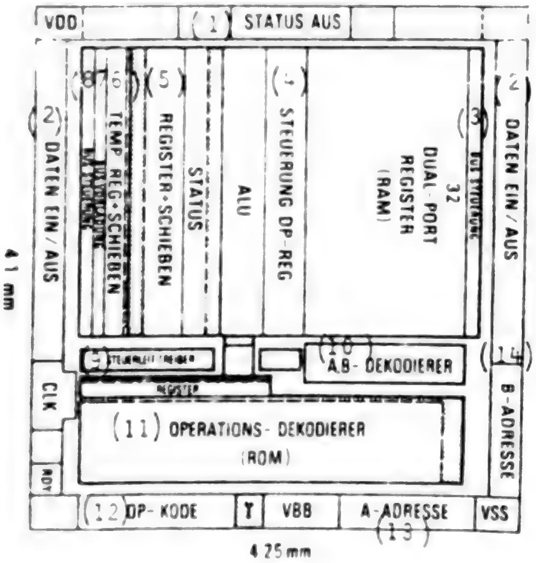


Figure 4b: The Topology of the Experimental 32-Bit Arithmetic Processor Was Designed in Accord With the Principle of Regular and Mutually Fitting Cells.

Key:
1. Status Out
2. Data In/Out
3. Bus control
4. Control DP-REG
5. Register + Shift
6. Temp-Reg + Shift
7. Bus preload
8. Bus control
9. Control-line driver
10. AB decoder
11. Operations decoder (ROM)
12. OP code
13. A address
14. B address

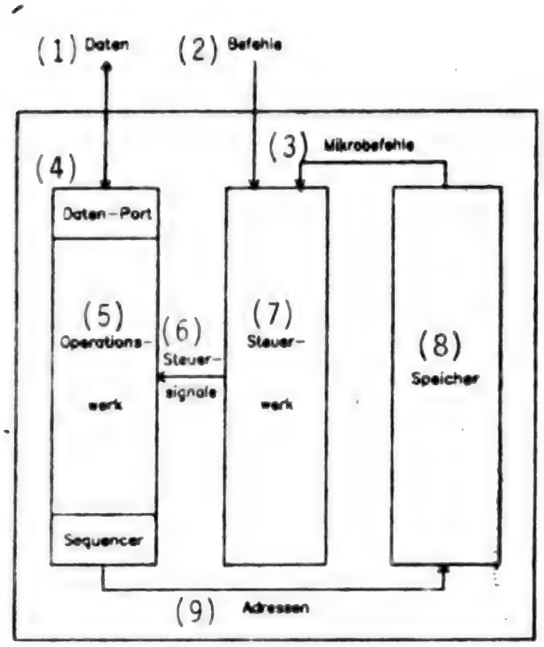


Figure 5: The Architecture of Future Processors Must Be Chosen so That It Can Be Imaged Directly in a Geometric Structure With Regular Blocks and Short Connections (Example: Peripheral Processor)

Key:

1. Data
2. Instructions
3. Micro-instructions
4. Data-port
5. Operations unit
6. Control Signals
7. Control unit
8. Memory
9. Addresses

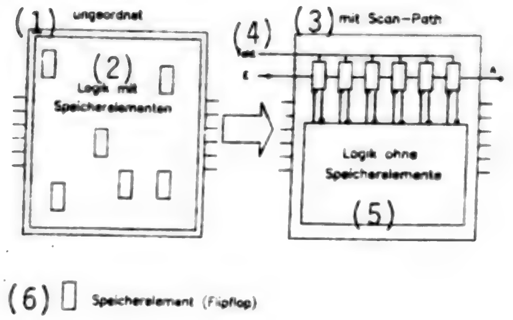

(1) ungeordnet
(2) Logik mit Speicherelementen
(3) mit Scan-Path
(4)
E
A
Logik ohne Speicherelemente
(5)
(6) Speicherelement (Flipflop)

Figure 6: Scan-Path Principle: Flipflops Are Connected to Form a Simple Testable Shift Register for the Test.

Key:

1. Unordered
2. Logic with storage elements
3. With scan path
4. Timing pulse
5. Logic without storage elements
6. Storage element (flipflop)

With the high processing power of VLSI components, combined with the limited number of pins, data transfer from and to the chip is too slow by an order of magnitude. Thus, sequential processing structures result almost necessarily for VLSI components with complex functions. Such processing structures again can be imaged favorable on processor structures.

Cell-oriented architecture concepts speed up the design. The cells should be organized hierarchically and should be capable of being arranged in sequences or matrices. Various cell concepts can be specified for the processor elements involving the operations unit, the control unit, and the memory:

For the operations unit, the slice technique is the most favorable. It is characterized by the sequential connection of function slices, whose processing width can be selected arbitrarily by the sequencing of bit-cells. The combination of cells of various function permits the build-up of complex functions. The slice technique offers some advantages: parallel processing, good surface-area utilization, minimal wiring problems, and great regularity. Its application range, however, is limited and only a few CAD aids are as yet available.

PLA structures have proven themselves for the implementation of control units (automatic generation, no wiring problems, large surface-area requirement, unfavorable running times with large PLAs).

For memories, only relatively small surfaces are available with logic-oriented components. Consequently, one must consider carefully how the memories are subdivided and what types of memories are used. For microprogram memories, a ROM is recommended (since it is dense and fast). For buffer memories (cache), implementation with an associated memory has proven especially suitable for VLSI.

100,000 Transistors on One Chip - and No Mistakes?

Quality assurance with future VLSI components requires measures that are supplementary to previous test concepts. At this time, three of these stand in the foreground:

- The design consistently takes into account the necessity of subsequent testing (test-compatible design).

- During the prototype test, the behavior of the VLSI circuits is investigated with a specially equipped electron microscope.

- With future VLSI circuits, self-testing logic will be used to an increased extent.

Because of the great complexity of logical VLSI components and because of the only small increase of the number of connection pins, the testing of components during development and production is becoming more and more laborious. Expecially the storage elements which are distributed within the logic circuitry (flipflops) require very many test steps: For the complete test of a 32-bit counter, this involves 2^{32} (about 4.3 billion) steps. An automatic testing unit with 1 million test steps per second would require more than 1 hour for this. The testing costs of this simple circuit then will amount to a few hundred francs - much too much for a mass product. To solve this problem, the storage flipflops in VLSI circuits are therefore connected together to a shift register (scan path) for testing purposes (Figure 6). The flipflops can be directly tested via this shift register. The logical circuit components offer many additional inputs from the shift register and consequently can be tested all the way through in simple fashion by means of a few test-bit patterns which are inserted into the VLSI circuit by means of the shift register.

To test prototypes of VLSI components, Siemens created a test system which facilitates a view into the interior of such a circuit. Here, a scanning electron microscope not only images the chip surface but also measures the line potentials and their dynamic behavior - not falsified by capacitive couplings. Together with a control and test computer, function defects can thus be identified down to the individual transistor. The objective is to automate this measuring system with the topology and the functional data of the circuit. The developer thus obtains perspicuous measurement results which quickly facilitate a better design of the circuit. Because of the high costs, this testing method, however, will be usable only in development laboratories and scarcely in mass production. For the production testing of VLSI chips, the researchers anticipate, in the longer term, to build self-testing logic directly on the chip. This will work in combination with the usual production testing automats, but will considerably unburden the latter. Concepts for self-testing during standard operation in the system also seem to have good chances. The integration of such self-testing circuits in experimental 32-bit arithmetic processors showed the effectiveness of this concept. Only about 10 percent of the component surface area is here taken up by the self-testing logic.

[Boxed item]

Experimental 32-Bit Arithmetic Processor

The experimental processor is used for the forward-going study of typical problems involving VLSI (Very Large Scale Integration): Modern processor architectures, new, improved design and layout techniques (reduction of time and costs), concommitant integration of self-testing logic on the chip, more highly developed MOS processes.

The 32-bit processor was produced in a modern NMOS technology (NMOS Single-Layer Polytechnology). A few characteristics: a metallization plane, gate lengths of 2 µm, low-ohm polysilicides for gates and conductor strips, 25,000 transistors on 17 mm^2 chip surface, 61 pins. The chip is designed with a high degree of modularity and regularity. The circuit executes logical and arithmetic operations. A control run for instruction decoding is integrated on the chip. The supply voltage is 5 V, the loss power is 750 mW, the limit frequency is 6.5 MHz. The processor performs a 32 x 32-bit multiplication in less than 5.5 µs.

8348
CSO: 3698/209

NEW CHEMICALS, EQUIPMENT FOR MANUFACTURE OF IC'S

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 20 Jan 83 p 7

[Article by hh.: "Fast Production of Conductor Plates with New Chemical and Optical Techniques--Laser Imagery Cuts Film Exposure from Hours down to Minutes, Development of Special Resists"]

[Text] Frankfurt, 19 January--The electronics industry and, closely intertwined with it, the abundantly growing information industry, are in a process of extraordinary change in technical terms. New chemical products contribute to this change. An example here consists of light-sensitive materials facilitating the production of highly-integrated semiconductor circuits in the photolithographic method. Computers control a laser exposure instrument which can--with extremely high resolution--write the very smallest image elements in a big format. A broad range of resist products is being used for conductor plate production as well as for microelectronics. Besides, there are novelties in the field of contactless surface testing.

Direct illustration using the laser exposure unit--that is the future-oriented technology of the new Eocom system for the illustration of films or conductor plates, in other words, a laser exposure unit for making precision originals [patterns] for copied circuits or for direct illustration of resist-coated basic laminates in conductor plate manufacture. The outstanding advantage of this laser illustration system, according to data from Hoechst AG [Inc] is the extremely short exposure time in comparison to conventional plotters. With a film exposure in the format of 440X610 mm, it is drastically cut from several hours down to 2 minutes. This system is a faster alternative to the optical photo plotter with the ability of directly illustrating photo resists.

The point of departure for the exposure of the light-sensitive material consists of digitalized data which were stored in a computer-assisted design system (CAD) on magnetic tape. The input unit analyzes these data to control the laser. In contrast to what happens in the case of the photo plotter with the moving light source, a laser beam is diverted and modulated in the case of the laser exposure unit--it is guided, line by line, over the light-sensitive material and thus causes exposure. The exposure speeds attainable in this fashion are by several orders of magnitude above those that can be achieved with electromechanical photo plotters. By means of built-in beam corrections, one can achieve positioning accuracies of 25 micrometers over the full format.

It is possible to expose silver halogenide, diazo, and photo resist layers as well as other light-sensitive materials. Polyester films, glass plates, or conductor plate base materials are considered as their carriers. For the first time it is now possible, with the help of the laser exposure unit, in the process of conductor plate manufacture, to insert a magnetic tape, prepared in the CAD/CAM system, directly into the system and one thus gets a ready-copied circuit within 30 minutes. The abbreviation Eocom combines the concepts of electronics, optics, and the computer. These are the activity areas of a group of scientists who gathered with the goal of participating in space technology with their own developments. Eocom however is also concerned with other techniques.

Because of their manifold uses, industrial endoscopes are irreplaceable where interior spaces and cavities which are difficult to get at must be examined. The cost-saving technique of nondestructive testing with endoscopes permits the fast optical check on surface quality and the processing status in new work pieces and parts subject to wear. The reliable judgment of impurities, combustion residues, and material flaws turns industrial endoscopes into indispensable aids for example also in the engine and turbine industry. The increasing demand for testing documentation is facilitated by the adoption of photo and TV cameras. Depending upon the aiea of applicability and the accessibility of the place to be examined, we use today either fixed endoscopes (intrascope), semiflexible endoscopes (uniscope), or fully flexible endoscopes (fiberscope).

Volpi AG, a specialized Swiss enterprise active in the fields of fiber optics, optics, and optoelectronics, late in the autumn of 1982 presented two "international novelties" in the field of contactless surface testing. These involve a contactless optical-electronic instrument with which one can test the surface nature of widely different parts. It is possible to make statements about the roughness as well as the thermal radiation characteristic whereby one can check any kind of parts, from a wire with a diameter of 0.4 mm up to large, flat surfaces. Using specially adapted fiber-optical probes, it is possible to test very small surface segments or to determine the average values for larger surfaces. In this way, it is possible quickly, without contact, and reliably to test various parts.

In the new image analysis system, both the computer-compatible, high-resolution camera and the fiber-optical exposure system, the optics, and the computer are coordinated with each other in an optimum fashion. This image analysis system was developed especially for intermediate and final testing (quality control) of test objects. The parts can thus be tested for surface flaws, dimensional deviations, or other irregularities. With the help of this new image analysis system, one can put together high-resolution testing automats with short station times.

Dry resists, such as Ozatec resists, according to data from the Kalle Enterprise (Hoechst AG), are particularly suitable for the efficient production of conductor plates. Ozatec dry resists are three-layer films in which a photopolymer layer is embedded between a polyester carrier and a polyolefin protection layer. Dry resists meet the rising requirements for environmentally safe processing; they can be developed in a purely aqueous-alkaline manner and they can be stripped. Resist types with a layer thickness of 25 micrometers are economical materials for pure etching use (print and etch). The three thicknesses of 25, 38, and 50 micrometers proved themselves in standard galvanization. When particularly thick galvanic layers are required and when big boreholes (tenting method) must be covered up, preference is given to resist types with a layer thickness of 50 micrometers.

The requirement for adhesion and stability in copper, nickel, and lead-tin baths is met by all Ozatec dry resist types. The resist type was developed for special cases of practical application, such as, for example, full and plug bar gilding. Conductor plate technique gives preference to negatively working resist types. Hoechst coordinated the Ozatec dry resist series along these lines but moreover also meets the need for a positively working dry resist. The latter presents some additional advantages, especially the possibility of multiple exposure. By pulling the carrier foil off already prior to exposure, we can achieve a particularly high resolution. In this way one can achieve structures on the order of magnitude of the layer thickness without any further trouble.

According to data supplied by Kalle, photo resist establish quality standards in microelectronics for contact, proximity, and projection exposure methods. To cover a broad processing range, the Kalle photo resist are currently being offered in four adjustments. In this way one can make layer thickness between 0.3 and about 3.5 micrometers by means of projection. Photo resists are suitable for all currently used exposure methods because of the broad spectral sensitivity of their photo-reactive components. Their absorption in the long-wave UV range is adapted to the most intensive emissions of the mercury high-pressure systems.

A light-sensitive stream printing emulsion is used in making high-grade screen printing templates. It is used mostly for the coating of screen-printing fabrics for conductor plate decoration but can also be employed for other demanding screen printing tasks. The screen printing emulsion can be used not only for standard work but also for the reproduction of the very finest lines and for raster work because it is mesh-crossing, high-resolving, and resistant to customary screen printing dyes, printing pastes, as well as etching and galvanic reserves. Sensitization is accomplished not only through bichromates but also with diazo compounds so that there will be no chromate-containing waste water.

The screen printing foils consist of polyester carrier foils upon which are applied the diazo-presensitized, negatively working layers in various thicknesses. In this way one can achieve precisely defined and uniform layer thicknesses. Screen printing foils are used wherever special emphasis is placed on high edge sharpness, matching accuracy, and uniform dye application. Essential advantages of the foils reside also in the high printing volume and printing quality, simple further processing, and good storage stability.

A directly and positively working diazo-duplicating film consists of a 180-micrometer thick, clear, transparent polyester foil (Hostaphan), which is provided with a yellow-light-sensitive diazo layer. To avoid Newton rings and air pockets in the vacuum frame, the surface is slightly matted. Compared to the silver film, the diazo duplicating film is distinguished by its very high resolution. It owes its good dimensional stability to the tear-proof polyester carrier foil. The film has adequately high density in the UV range which is a prerequisite for exposure on photo resists. Because of this property and the low sensitivity to scratching, it is particularly suitable for additional copies on photo resists and thus for re-copying of silver films. This is why this diazo duplicating film is used primarily where emphasis is placed on resistant originals for utility copies.

5058
CSO: 3698/186

NORSK DATA'S SKYROCKETING SUCCESS ANALYZED

Oslo DAGBLADET in Norwegian 19 Feb 83 p 19

[Article by Pal Jorgensen]

[Text] Norsk Data is a unique example of success in our crisis-ridden industrial sector.

Norsk Data is also a firm that produces almost as many millionaires as it does computers. Several employees have piled up fortunes in ND [Norsk Data] stocks they bought at a discount.

What are the reasons behind Norsk Data's meteoric success?

"Here we put people in the center of the picture. Employees here do what they want when they feel like it. The time clock has been thrown out. Results are all that count for us," said director Odd Grondal.

No tree grows as high as the sky. But the giltedged stocks in the "fairy tale" in our business sector, Norsk Data, are well on their way. This week the firm noted one more record quotation on the Oslo Stock Exchange. ND stocks with a face value of 20 kroner were sold for 237.50 kroner.

The record quotation was also a cause for rejoicing by firm employees. Profit sharing is one of the principles of the computer comet. This means that not only do employees share part of the profits, they can also buy stocks at a real discount. This has produced enormous profits for some of them.

One Hundred Millionaires

Norsk Data is a company that produces almost as many millionaires as it does computers, wrote the Swedish periodical, VECKANS AFFARER.

The statement may not be entirely accurate, but it is a fact that a good many employees have earned a tidy fortune from the sale of stocks. Some claim that as many as 100 of the employees have become millionaires.

"It is probably true that some of our employees have become prosperous men and women on the basis of their stock holdings. But most of them are only millionaires on paper. In other words, they are still holding on to their stocks," said director Odd Grondal.

Sold Too Soon

There are probably a few people in the firm who wish they had had the same patience as the "paper millionaires." Many sold their shares much too soon--and at much too low a price. One of the stories told is that one of the Norsk Data employees has the world's most expensive refrigerator. He sold his stocks early so he could buy a refrigerator. If he had retained the securities instead he could have bought an entire freezer plant today.

We can use the following example to illustrate how giltedged the investments have been. In 1973, a Swede bought stocks in Norsk Data for 1,000 kroner. Today he could sell them for 570,000 kroner. No small profit.

Secret

What is the secret behind Norsk Data? In 1967, three people started the firm. The goal was to produce minicomputers of the highest quality. And ND has been able to meet that goal. Today the firm produces top-quality computers. The products can compete with those produced by any multinational giant.

Since the start, things have just kept on growing at Norsk Data. From sales of a few hundred thousand kroner in the early years to last year's orders totaling 590 million kroner. Profits have also increased steadily, at an average of 55 percent a year since the beginning. The number of employees grew from 3 to 1050. And the stocks have risen in value too. From 3 million kroner at the start, the market value of Norsk Data has grown to around 2 billion Norwegian kroner today.

Timing

In other words, a very untypical Norwegian development in this period of crisis. What is the reason for this industrial fairy tale? What lies behind a success of such proportions?

"As we say in Norwegian, 'timing,'" said director Odd Grondal.

"While the English, French and Swedes were investing large amounts of money in the production of traditional computers based on the existing technology, Norsk Data got started building minicomputers. We make products that are technically very good and we make a great many products," he said, without blushing at his own self-praise.

Not Typical for Norway

In other words, the right product at the right time. But advanced technology is not the only thing responsible for the success. Norsk Data also operates its company in a way that is very untypical for Norway.

"We have done exactly the opposite of what other Norwegian companies usually do. At Norsk Data we have a rule that what others can do better than we can or just as well, we will leave to them. We concentrate on research and development," said Grondal.

"All in all, we do a lot of things differently, compared to other Norwegian companies. We have something unique. We are result-oriented, we believe in sharing profits and in employee influence," the director said.

Extreme Amount of Freedom

Norsk Data employees have an extreme degree of freedom. There is no time clock here. No one asks when one comes to work or when one goes home. At Norsk Data, only results count.

"Here employees work on what they want to when they feel like it. Our philosophy is quite simple: we trust the employees to make the right decisions every single day. So we must also trust that they know when to come to work and when to go home," said Grondal.

Norsk Data also has what is known as a "flat organization." This means there are few people in charge. Big decisions are made following discussions held by large groups of employees.

"That does involve putting a lot of time into making decisions. But so far we have been able to handle this without the meetings turning into farcical free-for-alls," said the director.

Japan and the United States

The "flat" organization also means that the firm has a very small personnel division, as well as a small administrative staff. The employees help to establish working conditions and wages.

"We have taken the best from Japan, the United States and Norway. From Japan we have taken the idea of making joint decisions. We have taken the 'drive' for profits and technological development from the United States. And from Norway we have taken our view of human beings," Grondal said.

He says there are three reasons for Norsk Data's great success. A focus on human beings, great flexibility and a desire for change. Other Norwegian industries could probably place greater emphasis on the last two items.

Complain Too Much?

Are Norwegian industries too defensive? Do they sit with their hands folded and complain instead of pulling themselves together and doing something about their problems?

"Norwegian industries are right to complain about some things. But they should also be able to correct some of the problems themselves. I think flexibility is the key word for the future. It is extremely important for industrial firms to snap up signals and make use of them," said Grondal.

"Our rule is that we work for change. We utilize all change quite deliberately. Large parts of Norwegian industry are much too static. But having said that, I must add that different branches have different opportunities," he said.

Halt?

Some day things may come to a halt for Norsk Data too. How long can the upward trend continue?

"For the time being, there is rapid growth occurring in our branch as a whole. There are no indications that the minicomputer branch has reached the saturation point. And we are also a small firm on an international scale, number 13 in the world. Our largest competitors in the United States are 50 times larger than we are.

"Our goal is to become a major supplier of computers all over Europe. We have already achieved this in Scandinavia," said director Odd Grondal.

The firm is also an important supplier of stock millionaires. It is listed on the stock exchanges in Oslo, Stockholm and London. But Norsk Data stocks are also traded in New York--at record high prices.

6578
CSO: 3698/243

AUTOMATED CENTER MACHINES CRANKSHAFTS IN ONE MINUTE

Paris INDUSTRIES & TECHNIQUES in French 20 Oct 82 pp 30-31

[Text] The PSA group has awarded the manufacture of its new four-cylinder engines to the SMAE [Automotive Mechanics Company of the East]. These engines include the XU gasoline engine of 1,580 cm^3 and the XUD-9 diesel engine of 1,905 cm^3. The two production lines rely heavily on computers and automation, for the firm's competitive position and the quality of the products demand this.

Careful attention has been paid to machining the crankshafts. These spheroidal graphite metal pieces are designed to operate in five bearings. Two automatic FKP [expansion unknown] machines have already been installed, and are ready for production to begin. Two others will be added later, so that production can reach its normal full operating pace by 1985. Each of these numerically controlled machines has six axes. They work with two milling rings, one with a triple bit and the other with a double bit. On each bit are 44 preset carbide strips with four cutting edtes: each edge machines up to 350 crankshafts. The rate is 50 pieces an hour for the crankpins and 69 for the bearings. The milling, done on a stationary piece, ensures greater precision.

These GFM [expansion unknown] machines were supplied and set in place by the Dudon Company. They are rigid and compact units, and consist of a fixed bench, two rams or stocks, one of which is stationary and the other mobile, and a lengthwise carriage (Z axis) equipped with a crane with a transversal movement (X axis). The milling unit, with its drum on which the bit is mounted, is moved vertically by the crane (Y axis). The different movements are controlled by DC motors with thyristors, by means of a reducer and ball-bearing screw. All the guidance pieces are covered with a layer of anti-abrasion synthetic resin, which provides a smooth movement, even at very low speeds.

The mechanical parts are lubricated by an electrically controlled centralized greasing device.

After proper lengthwise placement, drilling of the centers, and straightening, the crankshafts are moved by a conveyor belt to the loading robot. This robot "recognizes" the pieces by means of an automated detection system, and engages the machining cycle after the piece has been rigidly attached by two chuck pieces.

The lengthwise carriage with cross movements is controlled by a computer which receives the technical characteristics and size data of the crankshaft: these data include the radius of the crankpin and crank, and the positioning angle. At first the milling unit moves down in a straight line in the direction of the crankpin or the bearing to be machined. After that, by means of an automatic combination of the X and Y movements, it moves so that the bit will describe an inner circle which will remain constantly tangential to the part being machined. A rest piece, equipped with an optical device to maintain the theoretical axis, supports the crankshaft as close as possible to the bit. Any possible radius or length correction is made in mid-course. A third clamping device, mounted on the lengthwise carriage, keeps the piece attached steadily near the closest bearing.

The bit's downward-moving positions are reached one after the other by use of the lengthwise carriage. The real values of these movements are measured incrementally. They are systematically compared with the computer's theoretical data, and the differences are continuously compensated.

7679
CSO: 3698/218

NEW COMPONENTS FOR FLEXIBLE WORKSHOP INTRODUCED

Duesseldorf VDI NACHRICHTEN in German 5 Nov 82 p 14

[Article by W. Schuetz, R. Steinhilper: "Workshop Operates Night and Day"]

[Text] A "graveyard shift" at machining centers through the use of pallet magazines--that is a meaningful catchword when it is important to have a high degree of efficiency and an economical fabricating on expensive machines. Yet the horizontal "pallet depots" familiar up to now are gaining acceptance only slowly. One economical solution giving flexibility is vertical "pallet-cycling magazines."

A new concept for a pallet-cycling magazine, which was developed jointly with the Fraunhofer Institute for Production Technology and Automation (IPA), Stuttgart, is being introduced this autumn by the machine-tool manufacturer Bernhard Steinel for the machining centers BZ 20 and 25. It is a typical example of a low-cost and space-saving pallet storage in association with the unmanned operation of machining centers. Aside from the pallet magazine, this concept also involved monitoring systems for machine, tools, and workpieces, for the purpose of achieving an autonomously operating workshop in the third shift with respect to material flow and information flow.

Pallet Changer Eliminated

As a basis for the workshop, the machining center is already intrinsically well qualified to provide a trouble-free unattended operation, due to the vertical positioning of the workpiece pallet which is in the process of being handled, since this gives a good chip outflow during and after the machining--so that even given an extensive chip production there is no danger that the machine will get jammed. The pallet changer already available for machining centers uses two pallet stations lying horizontally side by side in swinging the pallets into this vertical orientation to effect the changing process.

With the development of a pallet magazine for the machining center, it proved possible to dispense completely with a pallet changer, since a pallet cycling principle could be realized which already incorporates within itself the process of swinging into the vertical position.

This cycling magazine is designed for between 9 and 27 pallet stations, and it executes all the requisite sequences and movements needed for the automatization of the flow of workpieces in the workshop: All functions, such as pallet storage, further cycling/feeding, and swinging into the transfer and machining position, follow a mechanically constrained sequence of movements with there being only one driving mechanism. The pallet changing (ejection of the used workpiece-pallet and bringing of the next pallet into the machining center) is done by a hydraulic cylinder which is incorporated in the machine. After 20 seconds, the machining can be continued with the next workpiece.

In this arrangement, the pallet cycling magazine can be used not only for the unattended graveyard shift, but also in the attended-to operation of the machining center in day shifts.

Workpieces can be mounted, checked out, and changed both on the upper side of the pallet magazine at the working height of the operator, and also on the pallet situated in the usual machining position, since access to the working space of the machine remains completely free even with the pallet magazine in place.

If the cycling magazine is completely filled for the night shift, for example, with even diverse workpieces mounted on pallets, the machining center automatically works through these in succession. In this process the empty magazine station is in a standby status in the transfer position, and after completion of the machining the worked-through pallet is passed out of the machine, the magazine cycles further, and the following workpiece enters into the machine. After identifying the new workpiece and calling for the requisite new machining program, the next machining begins.

Despite the free access to the machine's working space, the magazine is built very compactly, and the "double-decker" circling and storage of the pallets reduces the space requirements to about a sixth of the requirements for other magazines which are horizontally spread out. Thus, installed machining centers already in operation can be converted at not too great a cost even where the space availability for the workshop is small.

The unattended operation of a workshop involves the automating of not only the material flow but also the information flow. This includes the controling and monitoring of machine, tools, and workpieces during the entire operation. The paramount component of control for the machining center is the CNC [computerized numerical control] system.

Automatic Monitoring Systems

The allowable service lives of the various tools are fed in when the machine is set up, and a running total is kept by the CNC over the machining times. In the case of tools with a short service life, several identical tools are to be found in the magazine feeding attachment for use as replacement tools. When the point "tool service life exceeded" is reached, at the next tool change the replacement tool is automatically used. At the expiration of the service life of all replacement tools or when a replacement tool is lacking, the machine is brought to a stop.

Moreover, because it conducts a running measurement and comparision of performance, torque, and feed-force characteristics with the set points determined for the initial sample workpiece and stored in the control system, an automatic monitoring of tool wear and breakage is an important qualification for the unattended operation of the workshop.

The Control Compensates for Defects

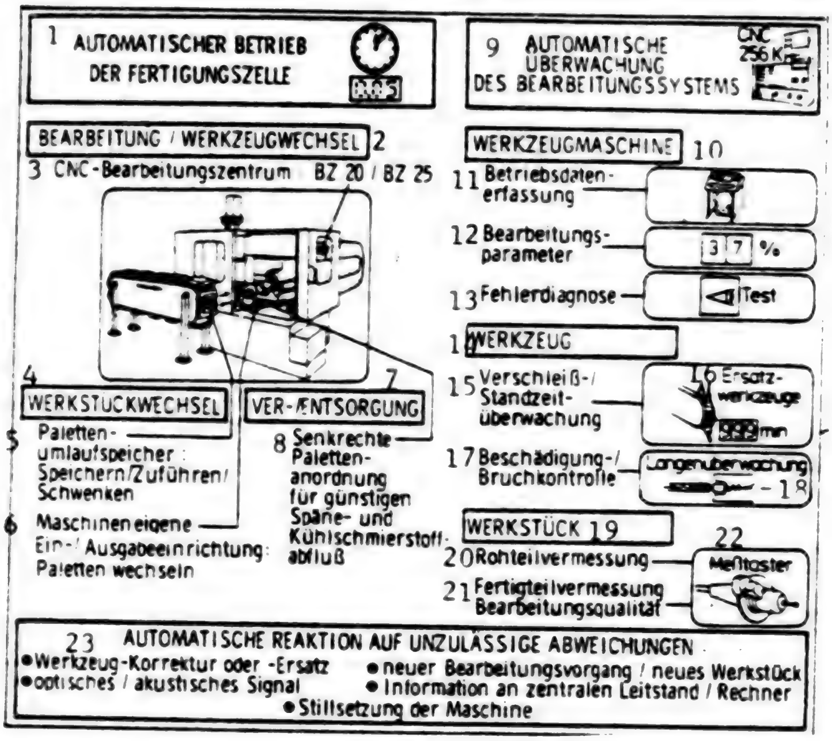
For monitoring the workpieces, a 3-D probe is used which can be transferred automatically from the tool magazine into the spindle. With this, every point on the workpiece can be probed in the x, y, and z coordinates, making it possible to identify unmachined parts, to control the mounting process, and to measure the machined workpiece. Deviations from the set points are reported to the CNC, which can compensate for these irregularities.

Because of the compact construction and the elimination of a pallet changer device, the expenditures which need to be made for such a workshop are less than those which in other solutions are necessary for solving the storage, handling, and pallet-changing problems. If one starts out with a mixed three-shift operation with and without operating personnel, this can have the following features:

- Day shifts with operating personnel: Short machining times per workpiece, an operation of the machining center free of interruptions from mounting processes, because the mounting is done during the essestial operating time, an uninterrupted spaced run-through of the machine, and a complete detaching of the operating personnel from the working cycle of the machine (efficient mounting of a number of workpieces);

- Unattended night shifts: Large machining times per workpiece, an uninterrupted, unattended, only partially monitored operation of the machining center.

The result of this is that the expenditures for pallet cycling magazine and monitoring equipment can be totally paid off after about 2 years in a variety of machining applications.


1 AUTOMATISCHER BETRIEB DER FERTIGUNGSZELLE
9 AUTOMATISCHE ÜBERWACHUNG DES BEARBEITUNGSSYSTEMS
CNC 256 K
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Längenüberwachung
18
4 WERKSTÜCKWECHSEL
7 VER-/ENTSORGUNG
5 Paletten-umlaufspeicher: Speichern/Zuführen/Schwenken
6 Maschineneigene Ein-/Ausgabeeinrichtung: Paletten wechseln
8 Senkrechte Paletten-anordnung für günstigen Späne- und Kühlschmierstoff-abfluß
WERKSTÜCK 19
20 Rohteilvermessung
21 Fertigteilvermessung Bearbeitungsqualität
22 Meßtaster
23 AUTOMATISCHE REAKTION AUF UNZULÄSSIGE ABWEICHUNGEN
•Werkzeug-Korrektur oder -Ersatz
•optisches / akustisches Signal
•neuer Bearbeitungsvorgang / neues Werkstück
•Information an zentralen Leitstand / Rechner
•Stillsetzung der Maschine

Figure 1. The Prerequisites for an Unmanned Shift at Machining Centers Are Not Only the Automatic Execution of all Machining and Material-flow Processes But Also the Automatic Monitoring of Machine, Tools, and Workpieces.

Key:

1. Automatic operation of the workshop
2. Machining/tool change
3. CNC machining center BZ 20/BZ 25
4. Workpiece change
5. Pallet cycling magazine: storage/feeding/swinging
6. Machine's own input-output equipment: pallet changing
7. Supply/disposal
8. Vertical pallet positioning for satisfactory swarf and cooling-lubricant discharge
9. Automatic monitoring of the machining system
10. Machine tool
11. Operational-data logging
12. Machining parameters
13. Error diagnosis
14. Tool
15. Wear/service life monitoring
16. Replacement tools
17. Damage/breakage control
18. Length monitoring
19. Workpiece
20. Unmachined-part measurement
21. Finished-part measurement, machining quality
22. Measuring probe
23. Automatic reaction to unallowed deviations
    - Tool correction or replacement
    - Optical/acoustic signal
    - New machining process/new workpiece
    - Information to central control station/computer
    - Shutting off of the machine

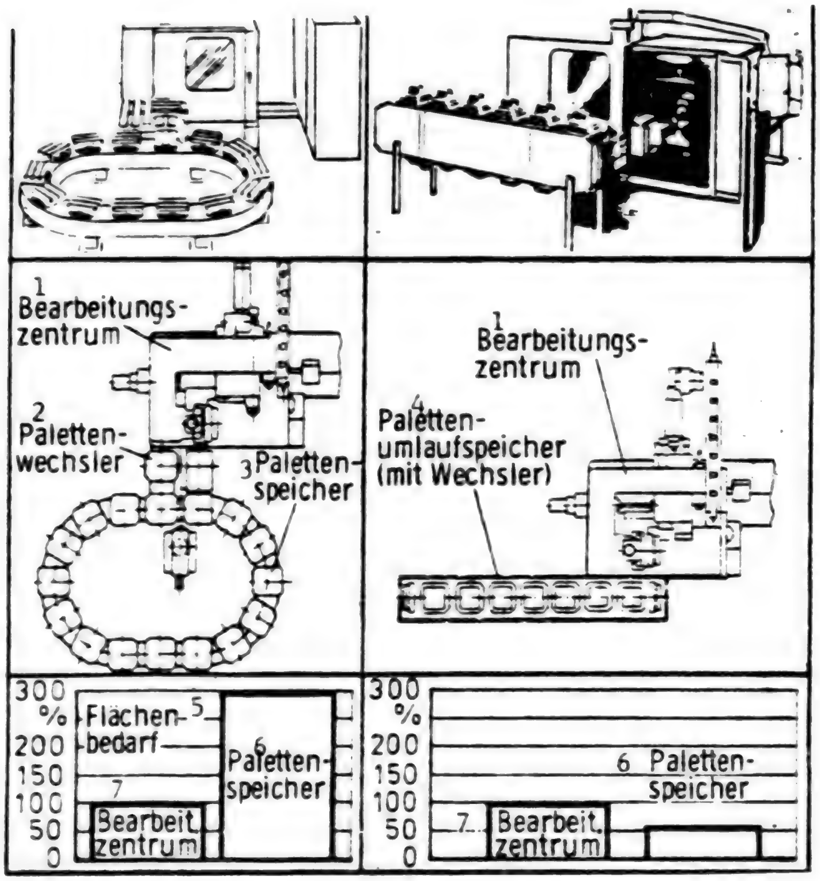

Figure 2. The Vertically Stacked Arrangement of the Magazine Stations in the Form of a Continuous Track Leads to a Very Compact and Space-saving Design.

Key:

1. Machining center	5. Area requirements
2. Pallet changer	6. Pallet magazine
3. Pallet magazine	7. Machining center
4. Pallet cycling magazine (with changer)	

12114
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WELDING-ROBOT GRIPPER MADE OF CARBON-REINFORCED EPOXY

Paris L'USINE NOUVELLE in French 3 Feb 83 pp 68-69

[Article by Pierre Laperrousaz: "Composite Gripper Being Tested"]

> [Text] A possible market for high-performance composite materials: robotics. A welding-robot gripper made of epoxy resin reinforced with carbon fibers is being tested by a large French automobile manufacturer.

High-performance composite materials may well enter the automobile sector in an unexpected way: through robots. At this very moment, the laboratories of a large French automobile manufacturer are testing a welding gripper made of epoxy resin reinforced with carbon fibers. It weighs 39 kg, compared with 54 for its aluminum counterpart; if tests are positive, it could be used on six-axis robots like those used to assemble car bodies. In the long run, this would represent a significant market for carbon fibers. Indeed, welding plants in the automobile industry commonly use some 100 robots; with spares, that would represent a "fleet" of 150 grippers.

However, it is not wise to count one's chickens... For the time being, cautiousness is the order of the day. "Even if the gripper meets technical specifications, we shall have to prove that it is economical and that we can manufacture it industrially," they said at the manufacturer's. In particular, this means that the tooling problem will have to be solved.

For the moment, CG Carbor, a small enterprise in Dardilly, near Lyons, uses 32 different molds to manufacture the gripper! "Certainly," they added at the manufacturer's, "we shall have to standardize the various gripper components to amortize more easily the tooling costs involved in the manufacturing of a complete line of grippers." Quite possibly, the use of composite materials may not be justified for all grippers, the larger (and therefore heavier) being of course given priority.

The advantage of using composite materials in a robot is of course to reduce the weight of mobile parts. When the weight of a welding gripper is reduced, its center of gravity gets closer to the "wrist" of the robot. Stresses along this axis are therefore reduced, as are the risks of failures and maintenance costs. The low gripper inertia permits quicker movements, and therefore higher production rates.

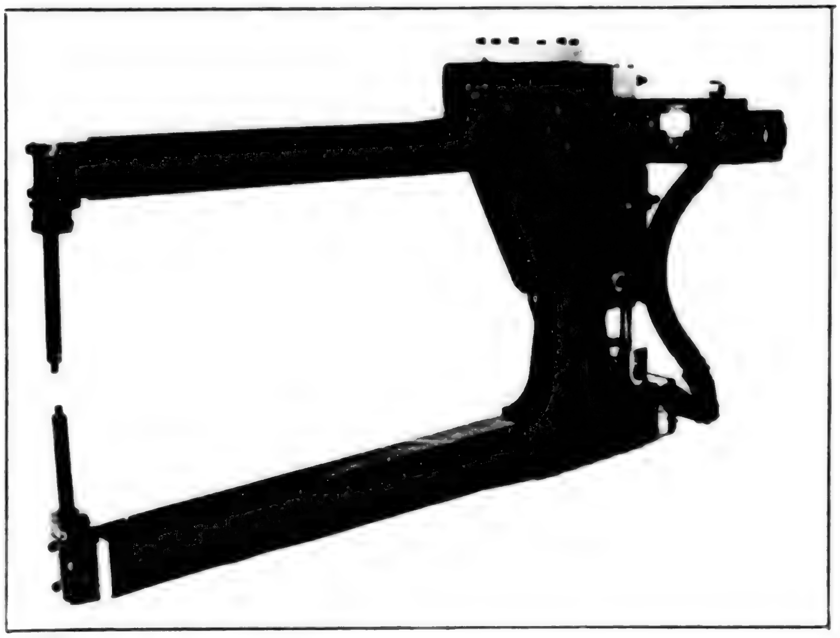

Figure 1. Welding-Robot Gripper Made Of Carbon-Fiber Epoxy

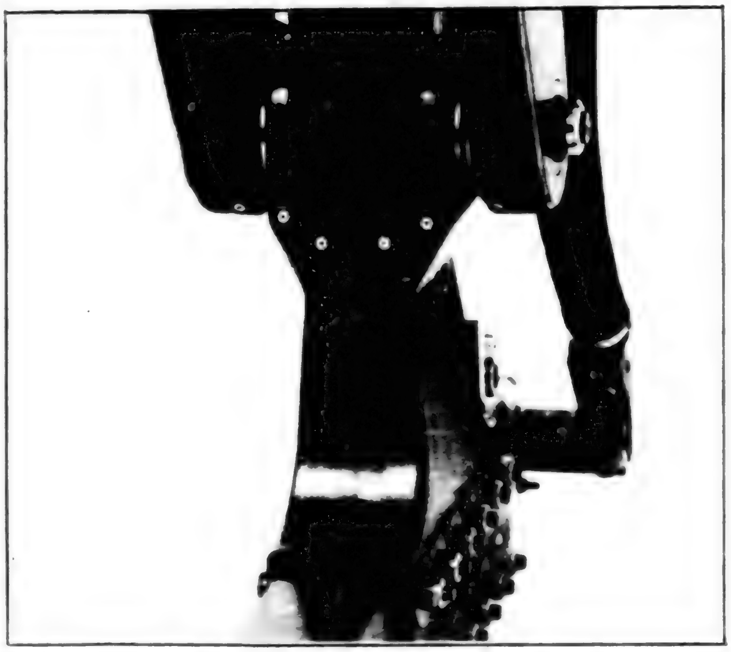

Figure 2. Detail Of Gripper Articulation

Finally, reducing the weight of one component may also have a chain effect on the whole robot design: for instance, the power-supply transformer could be located on the gripper itself; shorter conductors could then be used and the current consumption diminished; as a result, a less powerful transformer could be used.

Vacuum Injection Preferred To Preimpregnation

And (why not?) the arms of the robot itself could be made out of composite materials. But we have not yet reached that point... And the reserve displayed by the manufacturer is not a mere rhetorical precaution. Indeed, the development of a welding gripper designed to go through 4 million cycles involves quite a few problems...

Gripper elements that are made of composite material (a total of 12 kg of laminated material, including 3 kg of high-modulus fibers) are manufactured by vacuum injection. "We believe this method is preferable to preimpregnation for this type of part, because it makes it possible to obtain a better impregnation of the reinforcing fabric, and there is less danger of altering fiber distribution," we were told by Jean-Jacques Curt, manager of CG Carbor. The small enterprise in Dardilly (it employs 12 people) made the study itself, using the metal model and the user's specifications. It has an ITT 30-30 microcomputer with a printer and a plotting table to design structures, a photoelasticimetry bench, and it relies on the Lyons Central School's laboratory for fatigue tests...

According to Jean-Jacques Curt, this first incursion in the field of robots is promising as far as tools in general are concerned, i.e. not only for robotics, but also for handling equipment, manipulators, mobile machine parts (for instance, a carbon-fiber quadrant for a cable-twisting machine was made for Brondel, a Villeurbanne cabling-machine manufacturer), etc. "A foreign robot manufacturer consulted with us, and the first large developments might well come from this side," he said.

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INDUSTRIAL TECHNOLOGY

BRIEFS

SECOND-GENERATION ROBOT TO BE DEVELOPED, SEAM WELDER--To introduce a second-generation multi-axis welding robot with an automatic seam-welder, such is the objective of the Workshops and Yards of Brittany (ACB) which are signing a 20 million franc agreement with the Atomic Energy Commission this week. This decision reasserts ACB's determination to play a greater part on the robotics market. The Nantes company, which belongs to Alsthom-Atlantique, has some 20 years of experience in the remote-handling of nuclear materials. Nine months ago, it signed a licensing agreement for the sale and adaptation of Japanese OTC [expansion unknown] robots, which enabled it to sell 10 systems to subcontractors and to the heavy industry. These systems cost from 300,000 to 3 million francs. The most expensive, which require complex positioners, generate many studies and a lot of manufacturing work for ACB, the robot itself representing only a small fraction of the final cost. ACB has great ambitions: to double its production every year, to two robots per month in 1983 and four in 1984, while strengthening its position on the top-of-the-line robot market. This is why ACB decided to cooperate with the Atomic Energy Commission, which will supply its experience in the fields of data processing, electronics and automation to develop systems that will improve robot programming and seam-welding performances through the use of magnetic and optic sensors. [Text] [Paris L'USINE NOUVELLE in French 17 Feb 83 p 47] 9294

NEW ALUMINUM PROCESS--A new liquid aluminum refining process was developed by Aluminum Pechiney and Servimetal, which both belong to the French Pechiney-Ugine-Kuhlman group, the latter announced in a press release published in Paris on 9 February. The process is caused Alpur; it makes it possible to treat the molten metal continuously to eliminate all non-metallic inclusions as well as hydrogen and undesirable metals (lithium, sodium, calcium), the same source stated. Since treatment can start with the casting of semi-finished products (ingots), the system considerably reduces production costs for high-purity aluminum, which is indispensable especially in aeronautics or to produce thin foil. Five French plants are already equipped with Alpur processing ladles, and five more units have been exported to Belgium, Austria, Spain, the United States and Hungary; others are being manufactured to be sold abroad, the press release concluded. [Text] [Paris AUTO-INDUSTRIES in French 10 Feb 83 p 4] 9294

AID TO MANUFACTURING--The British industry office is reimbursing to domestic firms 50 percent of the planning costs for flexible manufacturing systems,up to a maximum amount of 50,000 pounds sterling (about DM 215,000). Moreover, a third of the development and capital costs can be underwritten as well. For these two assistance opportunities, 60 million pounds sterling and over 25 million pounds sterling are available up to 1985. In the FRG there is not very much of this kind of "indirect" promotion--that is, of the application end--in connection with flexible manufacturing systems, but for example just for one facility of the Friedrichshafen gear plant assistance is being given which from 1979 to 1984 will total DM 6.6 million. This year the BMFT [Federal Ministry for Research and Technology] project executor for manufacturing technology at the Karlsruhe Nuclear Research Center is granting a total of DM 8 million for 50 corresponding projects of outfitters. This "direct" promotion of new "subject matter" should have a multiplier effect. [Text] [Duesseldorf VDI NACHRICHTEN in German 5 Nov 80 p 1]
12114

CSO: 3698/221

SURVEY OF R & D EFFORTS OF FRENCH NATIONALIZED COMPANIES

Paris AFP SCIENCES in French 20 Jan 83 pp 2-6

[Text] A survey of the R & D effort in nationalized companies has just been made for the first time on the occasion of the presentation of the major results obtained by these companies in the last 6 months, by Mr Jean-Pierre Chevenement, minister of research and industry.

The decision to publish this survey was made last 31 August within the context of the creation of an observing post for the public industrial sector.

Up to now, information on the R & D effort in large companies was available only in bits and pieces on certain special events such as the publication of balance sheets.

We should note, however, that not all companies appear in these balance sheets, notably SNIAS, DASSAULT, and SNECMA.

Rhone-Poulenc: On 31 December 1981, the group included 83 wholly-owned companies and 88 jointly-owned companies. Rhone-Poulenc S.A., the mother company, is a pure holding company. The turnover of Fr 20,841 million for the first semester of 1982 represented a 16.6 percent increase over the first semester of 1981. Under identical conditions, the increase would have been 15.3 percent.

The research personnel for the conglomerate numbers 5,380 people in France, and 1,800 abroad. The budget for the first semester of 1982 was Fr 1,850 million, including fertilizers.

At Rhone-Poulenc, the research programs are directed toward four broad long-term areas:

--Biology

--Biotechnology

--Physical chemistry of the solids

--Special applications of technical polymers.

Pechiney Ugine Kuhlmann: On 31 December 1981, the PUK group included 68 wholly-owned companies and 44 jointly-owned companies, 28 of which are international trading companies. PUK S. A., the group's mother company, is a holding company. The turnover of Fr 20,882 million for the first semester of 1982 represents an increase of 2.2 percent. Under identical situations, the increase would have been 8.7 percent.

In 1981, the R & D expense was Fr 740 million, as compared to 610 million in 1980.

The extensive research effort carried out by PUK in the advanced materials area (carbon fibers, powder metallurgy, new alloys) has just resulted in perfecting a new high-iron-purity aluminum alloy with very promising applications in aeronautics. In the area of production technology CEBAL Company, the world leader in lead-tin seals for wine bottles, has just started a prototype workshop designed by the conglomerate, which should result in doubling the production rate.

Saint-Gobain: On 31 December 1981, the group included 109 wholly-owned companies (outside the data processing area), 47 of them French, and 4 jointly-owned companies, 2 of them French. Saint-Gobain Company, the group's mother company, is a pure holding company. The turnover of Fr 24,430 million for the first semester of 1982 represents a 13.8 percent increase. Under identical structures, the increase would have been 10.4 percent.

For the first semester of 1982, the research outlay was Fr 343 million (1.4 percent of the total income), as compared to Fr 284 million in the first semester of 1981 (1.3 percent), or a 21 percent increase. The research and development expense breaks down into a quarter for research, one half for development, and the rest for support of industrial activities.

Saint-Gobain owns 90 research units, 12 of them important research and development centers, and 27 of them more specialized towards development activities. The total number of personnel working in the research area amounts to 2,700, two-thirds of which work in France. The policy for recruitment of young researchers (high-level engineers trained for research) has been very actively pursued (12 new hires in France alone during the semester).

Research has been carried out in the general directions defined previously. Progress is particularly noteworthy in the areas of the rational utilization of energy; important improvements in the glass fibers area (Arlanda process); operation of a new, energy-efficient furnace for the production of reinforcing fiberglass.

In the area of materials research: thin molded cast iron, and application of the ZMC process to the rear portion of the Citroen BX, made entirely of fiberglass-reinforced plastic.

The company has acquired an interest in SOLEMS, a company engaged in research on photovoltaic conversion of solar energy using thin layers of amorphous silicium deposited on glass plates.

Compagnie Generale d'Electricite: On 31 December 1981, the CGE group included 29[illegible] wholly-owned companies and 30 jointly-owned companies, or a total of 323 companies, 217 of them French and 106 foreign. The Compagnie Generale d'Electricite, the group's mother company, is a pure holding company.

In 1981, the group's R & D expense amounted to Fr 1,950 million. Telecommunications and data processing represent almost 60 percent of this expense, particularly in the area of fiber optics transmissions (CIT-Alcatel in collaboration with the CNET [National Center for Scientific Research]), office systems development (telecopiers and synthesizing modules, etc.); broadening the range of possibilities offered by the E-10 telecommunications switching center, development of systems intended for future data networks, etc.

The areas related to energy comprise 25 to 30 percent of the group's expense: "traditional" energy (turbo-alternators, glass high-voltage insulators, etc.), and substitution energy as well as energy-saving processes (heat pump, photovoltaic conversion, electro-chemical energy storage devices, etc.).

Thomson: On 31 December 1981, the Thomson group included 120 wholly-owned companies, 77 of them French, and 14 jointly-owned companies. Thomson-Brandt, the group's mother company, is the second most important exploitation company, after Thomson-CSF. The consolidated income of Fr 22,770 million for the first semester of 1982 represents an increase of 17.1 percent. On the basis of identical structures, the increase would be 12.6 percent.

In 1981, the R & D expense amounted to around Fr 6 billion. Ninety-five percent of the research activities are carried out in operational units, with the remaining 5 percent corresponding to research carried out in the central laboratory at Corbeville.

For the most part, research is carried out by Thomson-CSF and is involved with the development of professional electronics. Thomson-Brandt uses in part the results of research carried out by Thomson-CSF (particularly in the area of components), but also uses its own research facilities, directed toward the design of new technologies and new products for general availability, weapon systems, and special electronics.

CII-Honeywell Bull: The CII-HB group results from the merging of two companies owned by the same stockholders: CII-HB (France), and CII-HB International (Netherlands). CII-HB (France) is the main industrial company of the group. The important increase in the income of the first semester of 1982, as compared to the first semester of 1981, has not been sufficient to compensate for either the increase in financial expenses resulting from the increase in interest rates and from the group's outstanding loans, or the increase in losses corresponding to currency adjustments in June 1982.

As far as R & D expenses were concerned, development expenses amounted to Fr 739 million in 1981, 68 million of which were related to contract work.

Research personnel amounted to 2,632 people in 1981, spread over 6 development centers (in Angers, Belfort, and the Paris area).

Research is mainly in the following directions:

--Extension and improvements in mid-range DP systems (DPS-7)

--Performance improvements in the architecture of digital networks (particularly through the introduction of new programs, the creation of operational interfaces, etc.)

--Microcomputers and peripheral equipment (and particularly their application to office systems).

Entreprise Miniere et Chimique: On 31 December 1981, the EMC group included 143 consolidated companies, 58 of them wholly owned, 2 jointly owned, and 83 through equivalency status. EMC, S. A., the group's mother company is a pure holding company.

In the first semester of 1982, the research expense amounted to Fr 60 million (1.3 percent of the consolidated income).

Besides the usual fields of research, the EMC group is conducting research programs calling upon the most recent technologies in such areas as advanced mechanics (robotics) and agronomy, or from the resources of biology: biological fixation of nitrogen, vermicomposting, biogas. In the latter field, EMC has acquired undisputed and original competence in the installation, implementation, and scientific tracking of biogas units in cattle raising. This has been possible thanks to the laboratory which has been equipped, the two industrial units which have been implemented, and the numerous contacts with related French and foreign laboratories.

CDF-Chimie: On 31 December 1981, the group included 28 wholly-owned companies, and 3 by proportional ownership. The turnover of Fr 6,493 million for the first semester of 1982 represents an increase of 6.8 percent, all factors remaining constant.

Research expenses have increased appreciably in 1982 (an increase of 22 percent is anticipated for 1982). In 1981, expenses amounted to Fr 175 million (as compared to Fr 185 million in 1980).

Research is mainly in the following areas: development of the various qualities of linear polyethylene, for which the company owns an original process. Development of the full range of special acrylates and methacrylates, which is an area in which the NORSOLOR affiliate is the only French producer. High performance thermo-hardening resins.

USINOR: On 31 December 1981, the group included 42 wholly-owned companies, 10 proportionally-owned companies, and 3 jointly-owned companies. The mother company is the main managing company. The turnover of Fr 14,788 million for the first semester of 1982 represents an increase of 20.7 percent. All factors remaining constant, the increase amounts to 20.3 percent.

In 1981, research expenses amounted to 84 million francs.

The personnel engaged in research activities numbered 330 people.

Renault: On 31 December 1981, the Renault group included 106 wholly-owned companies, 3 proportionally-owned, and 45 jointly-owned (mainly financial affiliates). The Regie Nationale des Usines Renault, the group's mother company, is the main industrial company. The total income (corresponding to the turnover plus the financial affiliates' income) of Fr 50,394 million for the first semester of 1982, represents an increase of 13.7 percent over the first semester of 1981. All factors remaining constant, the increase in income would be 14.2 percent.

In 1981, the Renault group dedicated around Fr 2.2 billion to R & D expenses, or 2.6 percent of the turnover (excepting the financial area).

In June 1981 EVE, an experimental vehicle intended to be used to test energy-saving solutions (aerodynamics, microprocessor control of the power plant, including a continuously variable transmission) was presented to the Energy Conservation Agency. The objective of reaching a 30 percent reduction in fuel consumption as compared to a reference vehicle (the R-18) was exceeded. The EVE project has now entered its second phase (EVE+).

SACILOR: SACILOR S. A., mother company and the main managing company of the group, included 64 companies, 32 of them wholly-owned, 9 through proportional ownership, and 23 through equivalency status. SACILOR's income of Fr 6,850 million in the first semester of 1982 represents an increase of 22.7 percent over the first semester of 1981.

The survey provides no information on the group's R & D expenses.

6445
CSO: 3698/193

EUROPEAN RESEARCHERS TO COOPERATE IN DEVELOPING ELECTRIC CAR

Helsinki UUSI SUOMI in Finnish 27 Jan 83 p 6

/Text/ Finnish industry investigates possibilities to develop a domestic electric car. Neste, Imatran Voima and Pakkasakku as well as Technology University have started a joint venture, and its goal is to evaluate electric vehicles technically and economically under Finnish circumstances, and to investigate the development conditions for an eventual domestic vehicle.

Representatives have been invited to the follow-up group of the venture also from Saab-Valmet and Stromberg. Half a million markkas have been budgeted for this year's research expenses.

Furthermore, Finland is participating in an international cooperation in this field. The goal of this cooperation is to determine the conditions for the use of an electric car, by taking into consideration the latest technological achievements in this field and the sociological and economic consequences that will be caused by the use of electric car.

The European cooperation in scientific and technical research ventures does not cause any participating costs to Finland, and the national share of the project will be carried out by means of financial aid from those involved in the venture.

For Road Use

The main goal of this venture is to determine what are the conditions for introducing electric vehicles for road use. The latest technical development trends as well as the sociological consequences caused by the introduction of electric cars are taken into consideration.

Furthermore, its purpose is to provide the authorities involved with all the necessary information they might need for decisions on the national or European level.

The research project, which is called Cost-venture 302, is valid for 3½ year, but it can be extended based on mutual agreements within the parties.

In addition to Finland, Denmark, West Germany, Sweden, England, France, Ireland, Switzerland, Austria, and the European Economic Community also participate in the electric car venture. Its total cost has been estimated to be 10 million markkas.

12190
CSO: 3698/189

PLANS FOR RENAULT'S FUTURE DEVELOPMENT OUTLINED

Paris AUTO-INDUSTRIES in French 23 Feb 83 pp 1-2

[Article: "Planning Agreement Signed By State and Renault"]

[Text] A planning agreement between Renault and the state was signed on 22 February by Messrs Jean-Pierre Chevenement, minister of research and industry, and Bernard Hanon, chief executive officer of Renault.

This agreement defines Renault's development objectives for the period 1983-1985, based on a 28.5 billion franc investment program (8.9 billion in 1983), including 18.5 billion for industrial investments in France, and a production objective of 2.5 million vehicles per year, compared with 2 million in 1982.

Financial provisions accompanying the planning agreement provide for a 1.65 billion French franc contribution in capital or similar funds.

According to Mr Hanon: "This planning agreement is both severe in its objectives and ambitious in its investments. It will cover four fields: automobiles, commercial vehicles, agricultural machinery and productics. Automobile manufacturing will absorb 75-80 percent of the investments scheduled, and commercial vehicles most of the remaining 20-25 percent."

"Renault," Mr Hanon added, "intends to strengthen its position in Europe and in the world through a stable investment policy that will enable it to hold its course. With 6.5 percent of the world market and a production of 2 million vehicles, Renault ranked 6th among automobile manufacturers in 1982; its objectives are 7 percent of the market and 2.5 million vehicles per year."

In 1982, Renault's foreign balance of trade showed an excess of 19 billion francs. It should reach 20 billion in 1983.

A development plan for commercial vehicles will be ready by the end of the first quarter of 1983.

To ensure its expansion, Renault will introduce a new model every year, modernize one factory every year, and adopt an "aggressive policy" on large foreign markets in Europe, North America and South America, where it plans to increase its share of the Argentine market from 27 percent now to one third.

At the same time as it develops its production facilities, Renault will continue its research effort, especially in the fields of electronics and new materials.

According to Mr Hanon, "sustaining an investment and production policy is an ambitious project considering that the market growth is only 1-2 percent per year. Our development objective will require highly effective organization and strict discipline. We hope for peaceful labor relations, no strikes and no absenteeism. We shall have to keep a close watch on our production costs and we must not allow any of our models to be a failure. This is going to be very hard to achieve, considering the complexity of the automobile industry."

Renault's chief executive officer also stated that, as far as agricultural machinery is concerned, "right now, it is difficult to get a clear view," and that Renault "will take the time to find an intelligent solution in an international context."

As far as productics (robotics, automation, computer-aided design and manufacturing) is concerned, Renault "will define a line of robots in a few months," and will develop "a broader and more aggressive policy."

In concluding the short signature ceremony, Mr Jean-Pierre Chevenement stressed that the planning agreement was "a flexible communication tool between the state and a national enterprise, which will retain its freedom and management autonomy."

12[illegible].
CSO: 3698/233

BRITISH LEYLAND, HONDA PLAN JOINT PRODUCTION OF AUTOMOBILE

Japanese Announce Agreement

Paris AUTO-INDUSTRIES in French 15 Feb 83 pp 3-4

[Article: "Agreement in Principle Between Honda and British Leyland for the Production of a Big-Engine Car"]

[Text] Honda and BL Ltd (formerly British Leyland) have signed an agreement in principle for the joint production of a top-of-the-line car in Great-Britain and in Japan, it was announced on 15 February in Nagoya by Honda's president, Mr Kiyoshi Kawashima.

According to Honda's president, an official agreement between the two manufacturers could be signed next week. Last 11 January, Mr Kawashima had hinted that the two companies were about to reach an agreement.

Some details remain to be settled, especially the question of whether the British version of the new model will be manufactured in a BL factory or in a new joint facility.

According to another Honda official, the new vehicle will have a 2,000-cc engine capacity and would become available in 1985. Honda specializes in 1,200-1,800-cc cars, and this is the first time it ventures to produce a larger car.

On the other hand, according to NIHON KEIZAI, the Japanese business daily, the two manufacturers have decided that the new model, which is called XX for the time being, would have a front-wheel drive. Each of the two partners will manufacture an engine that could be used on this car: a traditional six-cylinder V-engine for Honda, and a turbine engine for BL. According to NIHON KEIZAI, the models manufactured in Japan will be sold in Japan and in Asia by the two companies; those produced in Great-Britain will be sold in Great-Britain and in Europe, also by the two companies. Both companies, each on their own, will export these cars to the United States.

Honda is the world leading motorbike manufacturer and the 5th Japanese car manufacturer: it sold 1.22 million cars from February 1982 to January 1983.

British Call Announcement Premature

Paris AUTO-INDUSTRIES in French 16 Feb 83 pp 6-7

[Article: "Honda-Leyland Agreement: News Were Premature, According To Leyland"]

[Text] News from Tokyo according to which the final agreement between Honda and British Leyland for the joint manufacturing of a top-of-the-line car would be signed next week are premature, a spokesman for the British company stated on 15 February.

He said an agreement was about to be reached but various details remained to be settled and the agreement would not be signed for several more weeks.

The spokesman also denied the report that the two companies were contemplating manufacturing the car in Great-Britain in "a new joint unit." As had been agreed from the start, he added, each partner will sell its own version both on its own market and on that of its partner. As far as manufacturing is concerned, Honda's assembly lines in Japan will produce not only Honda's own version, but that of British Leyland as well, and the latter will be sold by the British firm through its Asiatic network. Similarly, British Leyland's Longbridge (Midlands) factory will produce not only its own version, but also that of Honda, which the Japanese firm will sell in Europe and in the United States.

9294
CSO: 3698/231

VOLKSWAGEN 'AUTO 2000' RESEARCH PROGRAM DESCRIBED

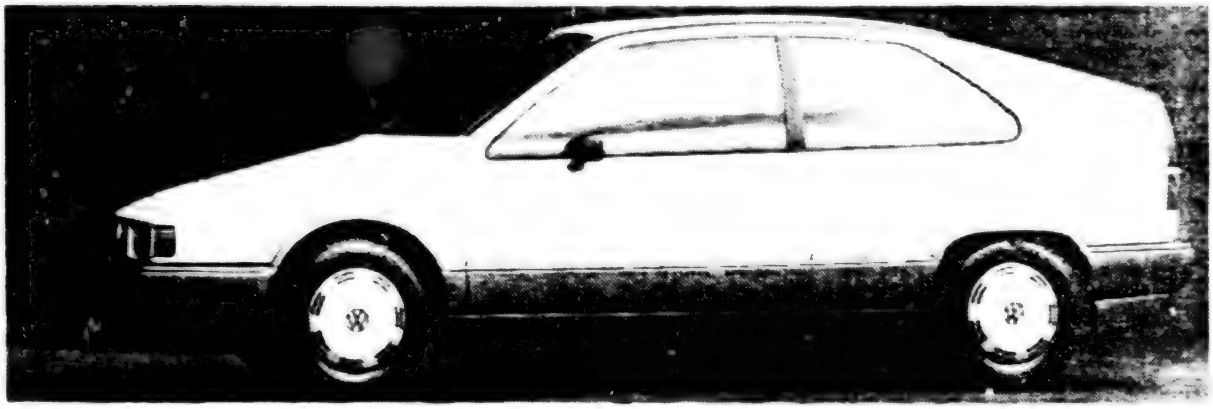
Duesseldorf VDI NACHRICHTEN in German 1 Oct 82 pp 26-27

[Article by Olaf von Fersen: "The Automobile of Tomorrow. Volkswagen for the Year 2000--Design Integrates Manufacturing Progress"]

> [Text] In planning the VW 2000, Wolfsburg was guided by today's problems. This guidance was primarily influenced by the mandate of greatest economy and the three main demands of improved engine efficiency, lowering of the empty weight, and reduction of air resistance. The result is a very practical car of the compact mid-class--just a little larger than the successful Golf model and just like it a hatch-back, with enough interior space for four grown-up Central Europeans, a large rear door, and adjustable rear space.

Progress, as everyone knows, does not move uniformly. If technology is not demanded, usually not much is happening and many good ideas are ignored and not used. Pressures do accelerate events, which is borne out by experience. When Wolfsburg decided to design and build a VW 2000 as a research project, it was clear that this project had to be based on today's knowledge, that on the other hand it also for the first time provided an opportunity to try out new ideas, which had so far only been tested experimentally and in isolation, in an actual real vehicle. These considerations covered not only the car itself but materials and manufacturing methods.

It is clear from the several versions of the projected car, that "market considerations" played a role in the planning phase. The basic vehicle was developed in two forms, an economy version and a luxury version. The former has an extremely economical diesel engine with manual transmission and stop-start device, while the latter has a powerful gasoline engine (Otto engine) and automatic transmission. Besides these two engines a third type was projected for pure methanol operation, which however, was discontinued when financial support was cut.



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[illegible]

[illegible]

springs and fuel tank are assembled, arranged on a lifting platform and then are mounted from below the body of the car. The whole dashboard group including heater, cooling, knee cushions for the passive restraint system, height adjustable steering column, foot pedal group, on-board radio, central electronic controller and other items are mounted outside the vehicle onto a rigid support panel and are then, after wiring and testing, inserted into the car through the door opening. The support panel is then attached to the door posts with screws. This interesting building block is designed for robot installation.

The Four Cylinder Engine Becomes a Three Cylinder Engine

All three of the engines planned for the VW research vehicle are derived from mass production series assemblies. The VW researchers decided to use engines with small displacement, which can be assisted by supercharging to obtain the needed torque and power. Their reasoning behind this was primarily based on a need for weight reduction and the desire to satisfy minimum space requirements. The research goal was to operate the engines with high mean pressure in the region of their optimum thermal efficiency and in this way to achieve the most economical performance.

The developers thus derived a three cylinder engine from the 1.6 liter production series diesel engine. With unchanged basic dimensions of 76.5 mm bore and 86.4 mm stroke the total displacement was 1191 cc. Except for the three-cylinder specific components such as the 120 degree crankshaft, the cam shaft and modified parts such as the cylinder block and cylinder head, all other parts are standard production parts.

In order to equalize the non-balanced first order moments, two possibilities were explored: one an equalizing shaft driven by the crankshaft, and two, the positioning of the driving mechanism in a decoupled auxiliary frame. Since the equalizing shaft could not be accommodated within the crank case, experiments were made with a version which carried the shaft outside of the engine. The latter solution did not comply with the specification and could not be used (a requirement was suitability for series production), but the results were so favorable that this development will in all likelihood be continued. Thus the auxiliary frame solution was used. It is however, not entirely satisfactory.

Since the diesel engine was to have direct injection, development of a specially suitable cylinder head was assigned to the AUDI/NSU research department in Neckarsulm. Special attention was paid to development of spin in the input channels and to the length and shape of the swing pipes. The Bosch-Installation with the electronic control injection method was chosen for the first time, and at that time was still under development.

Three charging mechanisms were available: an exhaust gas turbocharger, a compression wave charger (Comprex BBC) and a mechanical charge compressor. The choice of the turbocharger had little to do with the technical principles involved, and was primarily a result of the already existing experience with this device, and the time pressure.

It should however be mentioned that in an independent investigation very good results were also achieved with a four cylinder roto chamber diesel engine with "comprex" and boost intercooling. Here too development will probably continue beyond the work on the research vehicle project. The mechanical charger was planned to be used in the gasoline engine for the "deluxe version."

With a compression ratio of 20:1 and a nominal speed of 4000 rpm the 1.2 liter, three cylinder engine delivers 33 kW and its maximum torque at 2500 rpm is 98 Nm (Newton-Meter). As development basis for the supercharged gasoline engine one could fall back to the rebuilt four-cylinder Polo engine with 1046 cc displacement, not yet commercially available then. Since the projected driving performance required about 55 kW, the four cylinder engine was fitted with a mechanical compressor (Roots) with an unusual drive mechanism. It consisted of a conical belt driven by the crankshaft with a variable transmission ratio regulated by centrifugal force. This permitted powerful charge at low revolutions followed by a gradual decrease of the charging pressure. In addition there is an electromagnetic coupling through which the charger drive can be interrupted and the engine can then operate in a suction mode.

Mixture formation is achieved through an electronically driven injection device and for the ignition mechanism an electronic high voltage transistor installation was chosen with build in ignition-angle performance characteristics and an adaptive knock limit regulator.

A remarkable detail of both engine developments is the choice of light metal for the casting of the engine block and cylinder head. Several possibilities were examined: dry and wet bushings, open and closed deck constructions, coating of bores and wet aluminum bushings.

The material used for the cylinder block was recycled aluminum which was less expensive than cast iron. Best results were achieved with "Nikasil" coating, where calculations showed that the cost disadvantage in mass production would be greatly reduced by use of die casting methods. Also its great dimensional stability (little reworking) low spoilage rates and a weight reduction of about 10 kg offered great advantages.

The power in the "economy version" is transmitted by a five-speed manual transmission with an additional automatic flywheel device and fuel disconnect. The auto uses an additional mechanical coupling, which in the free wheeling drive phase separates the flywheel from the crank shaft. While the engine is stopped through blocking the fuel supply, the flywheel continues to rotate while its connection with the power output is also automatically disconnected. Pressing the gas pedal automatically reconnects the fuel supply, and the flywheel sets the engine into motion again.

Electronics Insure Unique Characteristics

The function of the group is controlled by an electronic regulator, which insures running and proper coordination between the various elements. The gasoline engine works together with an automatic transmission. It has three forward speeds, in addition to the usual converter and planetary gears. It actuates an overdrive gear by a gear lever position marked "E," which with proper use provided an additional "savings opportunity."

Although the drive mechanism is very similar to that of the Golf, a few special features are of interest. The swivel bearings and shock absorbers were made of aluminum instead of cast iron. This provided a weight saving of 70 percent. The rear axle connecting rod with an integrated stabilizer consists of glass fiber reinforced plastic (GFK) and weighs only half of the series production design. Plastic wheels are 40 percent lighter than the steel wheels of the large-scale production series, and as cost calculations show, costs are considerably lower than those of aluminum wheels. The brake installation includes an anti-blocking device [Blockierverhinderer] which was developed in cooperation with the Alfred Teves GmbH.

As could be expected, electronic components are used for instrumentation. The instrumentation group consists of three parts. The center field provides traffic information based on the system "Ali" (Automobile drivers' guidance and information system) from Blaupunkt, which requires certain corresponding devices in the road network. To the left and right are located liquid crystal numerals which show car velocity and engine speed, by means of the transreflective layer technique, which provides good visibility in sunlight. Possible engine faults are indicated by a warning system, where a light provides the optical signal and a synthetic voice tells where the difficulty lies.

The Volkswagenwerk research vehicle exists in two drivable copies which are in no way planned to be museum pieces. They are planned to be the basis for further experiments and developed. The active interest of the public at the International Auto Show (IAA) 1981 indicated that the VW 2000 does not ignore the ideas and needs of today's drivers. Some prospective buyers got out their checkbooks and were ready to spend a six digit sum. It would however have been not enough in this case, because for the equivalent value of one of the little Wolfsburgers one could obtain a horde of Rolls-Royces and Ferraris.

Technical Data: VW 2000

Engine

Engine A: Water cooled three cylinder diesel engine, direct injection, 76.5 mm bore, 86.4 mm stroke, 1190 cc displacement.

Compression ration 20:1, Turbocharger, Power : 33 kW at 4000 rpm, optimum torque [illegible] Nm at [illegible] rpm.

Engine B: Water cooled four cylinder gasoline engine with electronic suction tube injection and performance characteristic steered, high tension transistor ignition, with adaptive anti-knock control

75 mm bore, 59 mm stroke, 1043 cc displacement.

Compression ration 8.3:1, Roots compressor with continuously variable drive and electromagnetic disconnect coupling.

Power: 55 kW at 5800 rpm. Optimum torque 106 Nm at 4000 rpm.

Transmission A: Five speed with inertia automation and free-wheel disconnect of fuel supply.

Transmission B: Hydrodynamic transmission and three step planetary drive. Fourth gear : third gear and free wheeling.

Chassis: Self-supporting body; wheel support--front: spring legs, rear: Rack and pinion steering, two circuit brake system with disk brakes. Brake power amplifier and anti-blocking device, Plastic wheels with dimensions 155/70-13.

Dimensions: Wheelbase 2450 mm, Track width 1410/1356 mm, Length 4015 mm, width 1670 mm, Height 1353 mm, empty weight 780 kg, useful load 400 kg.

Turning radius 10.5 m, Air resistance coefficient (cw) = 0.25.

Driving Performance	A Engine	B Engine
0 - 100 km/h seconds	20	12
Maximum speed	151	180
Fuel consumption one third mix liter/100 km	4.2	less than 7

799.
[illegible]: 5570/151

KUKA ROBOT MOUNTS WHEELS IN AUTO PLANT

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 25 Jan 83 p 11

[Article by G. M.: "A Kuka Robot for Wheel Assembly in Auto Production--System Offered for Welding Transfer Lines and Robots--DM220 Million Sales Volume in 1982"]

[Text] Kuka Schweissanlagen-Roboter GmbH, Augsburg. The company, which is worldwide in the upper third of robot suppliers, is training for a special kind of premiere. A car--ready but still without wheels--is hanging in the workshop on a simulated piece of assembly line. An orange-colored robot is ready for wheel installation and it does the job with the help of a visual sensor and corresponding special tools. It can install two wheels on the assembly line in 38 seconds. This novelty has already progressed beyond the study of a pilot project.

The Kuka business management so far has not learned of any other case in which the use of robots is impending for this purpose faster than in that "well-known" German automobile producer to whom the first copy of this machine is to be delivered by the middle of this year. Plans call for the item to be ready for series production by the end of this year. This means that robots, which participate in final assembly in a car plant, will be ready for the first time. But they are only the forerunners of a development which has been expected only for the end of this decade. The use of such robots of course is no cheap thing. Together with the necessary periphery, this calls for an investment of about DM2 million according to Kuka. This means that one can practically replace five men during single-shift operation. Robot use basically is profitable only in the two-shift operation, remarked Bernhard Wollschlaeger, chairman of the Kuka business management.

The wheel assembly robot is not the only project with which Kuka is trying to broaden its robot program. The company also wants to round its range of products off "downward." This relates to the "weight class." Kuka robots can move weights of up to 100 kg and work with pressure forces of up to half a ton. They thus belong to the "leading class." The company will possibly present a lower weight category at the next fair in Hanover.

In a technology as full of innovation as robot production, innovations are an indispensable means for the preservation of competitive capability and the guarantee of lasting growth. In this respect, Kuka can be satisfied with the results of the past several years. Last year alone, the sales volume in this still rather young line doubled from DM36 million to DM72 million. Wollschlaeger calls the earnings--the robot production effort, started in 1976, has been running in the black since 1980--"average" for machine-building industry conditions; but here one must also take into account the above-average development effort for robot production (7 percent of the line's sales volume).

This means that capacities have been created which will permit a certain degree of additional growth. Wollschlaeger however anticipates a continuation of the most recently very abrupt increase in the sales volume. During the current year, the DM100-million mark will certainly not be achieved according to his expectations. The existing capacities, in three-shift operation, facilitate a sales volume of DM100-120 million.

Kuka estimates its share of the market in the FRG at about 40 percent if the Volkswagen Works with their robot production division for in-house needs are deducted. With VW the figure would be about 20 percent. On the whole, one can estimate that about 700 robots have been installed in the FRG; in 1983, their number might come more or less close to the 1,000-mark. One thing that is characteristic of the growth opportunities on this market is the expectation that the international number of installations, according to Kuka estimates and with a narrow definition of the concept of "robot," might increase from 12,000-14,000 in 1980 to 120,000 units in 1990. Of that number, about 12,000 might be in the FRG, with the auto industry still holding a clear lead with 5,500 units ahead of the electrical industry with 2,400 and the machine-building industry with 1,200.

Robot production at Kuka however is not the only and not even the biggest line. The emphasis here to the extent of about 60 percent out of the total sales volume of DM221 million (consolidated, more than 300), is on the welding transfer lines; and then there are also certain special machines.

Kuka Times Four (boxed item)

The Kuka-Schweissanlagen & Roboter GmbH is only one of four sister companies in Augsburg, all of which have "Kuka" as part of their names. The company, which is involved in environmental technology, is currently having some trouble because the reticence of community customers has cut the volume of incoming orders by 20-25 percent. The West German Armed Forces are less restrained in placing their orders with this defense-technology enterprise. On the whole, the sales volume of the Augsburg Kuka Group in 1982 came to just about DM420 million; the average number of employees came to a good 2,000. All four enterprises belong to the IWKA (Karlsruhe Augsburg AG Industrial Works) which earlier belonged to the Quandt Group but which today, according to board of directors chairman Wolf-Hartmut Prellwitz, is a public company with a broad capital spread.

TRANSPORTATION

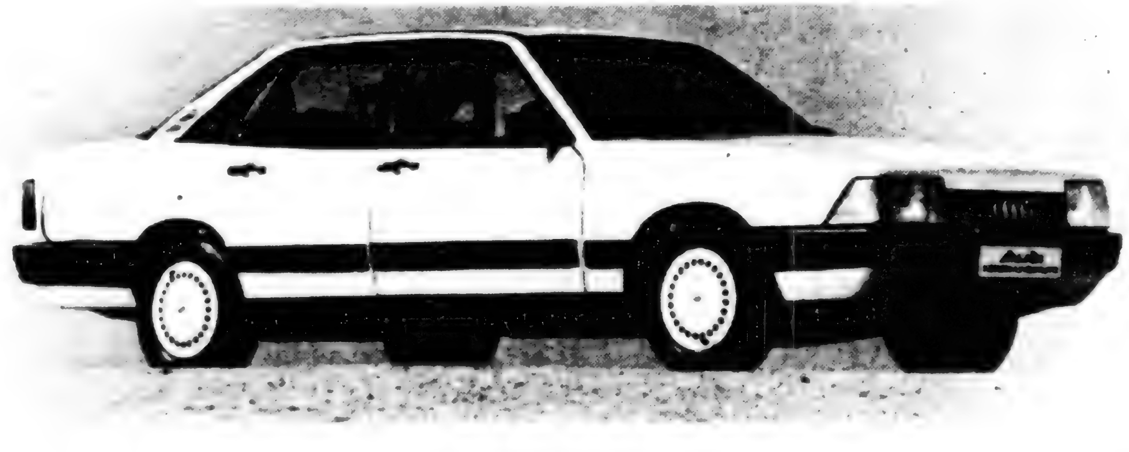
AUDI WORKS ON MID-CLASS CONTRIBUTION TO 'AUTO 2000'

Duesseldorf VDI NACHRICHTEN in German 8 Oct 82 pp 22-23

[Article by Olaf von Fersen: "Tomorrow's Automobile, AUDI's Research Automobile--More Realistic Than Fantastic"]

> [Text] As one of the four participants in the project "Auto 2000" of the Federal Ministry for Research and Technology (FMRT), AUDI decided on a vehicle in the upper midclass. The FMRT announcement specified for this "Category II" a maximum empty weight of up to 1250 kg, driving performance of at least 140 km/h4 maximum, and a maximum acceleration of 13 seconds from 0 to 100 km/hr. It also demanded sufficient interior space for four passengers and a useful load of at least 400 kg. In addition fuel consumption was limited to a mixture-value of 9.5 liters per 100 km.

In contrast to the three "contestants" in the project "Auto 2000," the AUDI engineers set their project milestones on a shorter scale. The Ingolstadt research car deserves this title without restriction, but both idea and concept make it a prototype for the middle of the present century, rather than a car with the time goal of the year 2000.



Form of the "AUDI 2000" body is based on aerodynamic principles. The smooth surface area, including the glass areas, yields an air resistance coefficient (cw) of 0.30. The same value is also reached by the new AUDI 100, which was introduced end of August.

In the rather short periods allowed by the FMFT, the result turned out to be a spacious four door sedan for five fully grown Central European. The allowed load exceeds the target by a full 100 kg, the empty weight of 1179 kg did in no way reach the prescribed maximum limit, the performance date generously exceeded the FMFT specifications with an acceleration of 12 seconds from 0 to 100 km/hr and a peak velocity of 180 km/hr. It also is interesting that among the four car builders Audi used by far the smallest amount of research funds: DM5 million. Nobody would probably notice the research car in the rush hour traffic in downtown Munich or in the center of Duesseldorf. It is remarkably similar to the new production type, the model 100-see VDI Nachr. 36/82. Under the outer cover, which is in no way spectacularly formed, are hidden indications of the future. Some items permit conclusions about the future course of Audi engineers, who have adopted the motto "Progress through Technology."

The fact that the engine had to be derived from a production line engine of the company pallet was clear because of time and financial limitations. First considerations were directed towards a four cylinder gasoline (Otto) engine with a displacement of 1.8 liters. In order to be able to operate this engine with lean mixtures, and to achieve efficient exhaust operation, the cylinder heads were designed with turbulence chambers which until now were used only in diesel engines. The four cylinder engine produced unusually clean exhaust gases, was however not outstanding in its efficiency. At the same time some development work was done on company proprietary diesel engines with five and six cylinders. Both were equipped with turbochargers to achieve the necessary power of 70 kW, required for the weight of the car and the desired driving characteristics. A fourth solution was finally chosen: a gasoline engine of 1.6 liter displacement with a turbocharger. With a bore of 79.5 mm and a stroke of 80.8 mm equalling a volume of 1588 cc, the cylinder block is very similar to the 1.6 liter production series block. Instead of being made of cast steel, it was made of cast light metal and was fitted with dry bushings. The cylinder head is also made of aluminum, the vertically placed valves are actuated by a toothed belt driven overhead camshaft. Instead of the production-run cup-tappets, Eaton hydrotappets [Hydrostoessel] were used.

Mixture Formation Insured by Constant Pressure Carburator

Mixture formation takes place in a SU [expansion unknown]-constant pressure carburator with control of the air cross section by means of a circular slide valve. This horizontal carburator is located in front of the small turbocharger (Hitachi HT 15). By arranging the carburator in front of the air compressor two advantages were achieved: the liquid components are well atomized in the mixture of the compressor wheel rotating at high speed, and the evaporation in the pressure pipe compensates for heating of the mixture caused by compression. According to the developers, mixture temperature at the intake is 50 degrees C with an outside air temperature of 20 degrees C. A supercharger intercooler is therefore not required.

Combustion chambers are formed by the level underside of the cylinder head and the hollows in the piston bottoms. In the top dead center a relatively wide compression space of 5 mm was provided between the rims of the hollows and the head to achieve clean combustion and minimum HC emission. Rapid combustion is achieved through twisting caused by the form of the inlet channels and by turbulence caused by the strong pressure. The unusually high compression ratio of 9.0:1 for a turbo engine is part of the futuristic concept. The small charger, the optimized mixture formation, valve motion control times practically without overlap, and a limitation of the boost pressure to a maximum of .45 bar yielded unusual operating characteristics. The maximum boost pressure occurs already at 2000 rpm and the torque already reaches values at this speed which exceed those of the 1.8 liter aspirating production engine, which requires a greater nominal speed. The maximum torque of 168 NM (Newton Meter) occurs at 3500 rpm. Peak power of the turbo engine of 80 kW corresponds to 5000 rpm, 600 rpm less than those of the equally large aspirating engine.

Performance Characteristic Ignition Includes Knock Sensor

Expensive ignition control is required to provide error-free operation at such a high compression ratio and to supercharge. The electronic performance-characteristic ignition was developed in-house. The device includes a knock sensor.

Under partial load the ignition point control is based on optimum economy. Under full load it is set back by 3 crank-angle degrees below the knock limit. If conditions are changed by external factors, the electronic control device adapts itself to the new conditions. Under partial load the engine can operate with a very lean mixture up to lambda 1.3. This turbo engine achieves not only good driving performance, but good economical operation and it meets the required emission characteristics. Fuel consumption values based on 100 km are: for the city cycle 8.5 liters, for constant speed at 90 km/hr only 5 liters, and for 120 km/hr only 6.9 liters.

An engine with such speed characteristics is suitable for driving with very "long" speed reduction steps. For the research car the production series, five speed transmission was suitable changed. The driving gear acts--as it is traditional for Audi--on the front wheels. Arrangement of the chassis corresponds to the present style of the company: shock absorbers for the front wheels, and in the rear of torsionally elastic rigid axle with guide rods.

The alternative materials chosen for some of the parts are different. The swivel bearing of the shock absorbers, including the supports for the saddle of the disk brakes were made of aluminum instead of cast iron, and the Panhard rod of the rear axle guide was made of fiber reinforced plastic material. Both contributed to considerable weight savings. Remarkable is also the use of compact bearings for the front wheels, which yield space and weight advantages.

In order to meet noise limitation requirements, the engine was enclosed in a capsule which is closed on top by the engine hood. Access to the engine is not too difficult. The air filter (on the right) and the radiator (on the left) were placed in the empty space on each side of the capsule. The capsule is closed in front and extends in the rear beyond the transmission. The inner universal joints--for better cooling--are located outside of the side walls. If the air temperature reaches 95 degrees C in the capsule interior an electrically driven blower located on the side of the carburator is automatically switched on. It receives outside air through a duct, whose opening is in the front wall of the capsule. An additional new engine detail is related to the engine suspension in the vehicle. Hydraulic dampers with an integrated counter balancing mass are used, whose frequency is electronically regulated corresponding to the engine speed.

Body Without Roof and Bottom

The body structure is based on a steel cage, whose front longitudinal supports are designed to be deformable. In front and in the rear the basic frame carries a screwed on aluminum support with a layer of plastic foam, under an outer skin made of very durable plastic. The front and rear side parts are made of aluminum sheet and are screwed to, or screwed and cemented to, the main structure. Cementing is also used for the front and rear glass parts, which are smoothly connected with the outer skin. Similarly the closed door windows have smooth transitions. If the windows are rolled down, they move slightly towards the interior in their guides and then move downwards. Steel frames with built-in protective side brackets contain the crank mechanism, lock components and door hinges. The exterior skin is again made of sheet aluminum.

A sandwich construction, considerably more compression and torsion resistant than sheet steel, was created for the roof. It consists of glass fiber reinforced upper and lower layers with an aluminum cell structure as an intermediate layer. This roof produces a weight reduction of about 60 percent, as compared with a conventional pressed steel part. The vehicle bottom which is in the form of a floor pan, made of fiber reinforced, temperature resistant synthetic resin plastic contains hollows on its sides which are reinforced by hard foam cores. Before joining this floor pan with the upper body, it is fitted with the carpet floor, seats, transmission and brake levers, and also contains the guide rods for support of the rear axle and an enclosure which securely envelopes the fuel lines. The completed car bottom is joined with the upper body by cementing and by flanging of a sheet metal border. As compared to a steel bottom it does not offer any weight advantages in its present form, it does however offer better temperature and noise insulation, greater rigidity, and protection from corrosion.

The engine hood and the baggage compartment cover also deviate from the conventional sheet metal construction. The former consists of two layers of aluminum sheet, connected by cementing and flanging, with an intermediate layer of cellular organic material. At the front part of the hood there are bulges which are filled with polyurethane hard foam and which have deformation characteristics which provide better pedestrian protection in case of a collision. Here again, in comparison with sheet metal construction, a 60 percent weight saving and additional torsional rigidity were achieved.

Malfunctions Are Indicated Acoustically

The five seater sedan is extremely spacious. Shoulder and elbow widths are 1470 mm and the headroom above the front and rear seats are generous 957 respectively 973 mm. In the center of the rear a child safety seat can be folded down and on both the left and right sides there is sufficient room for two adults. All seats are fitted with automatic seat belts, and the front seats are fitted with additional air bags.

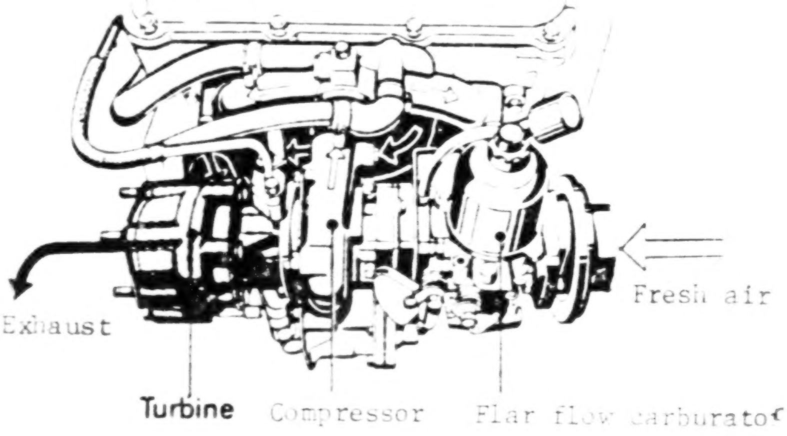
Instrumentation is dominated by two large circular scales. The left scale shows instantaneous fuel consumption in liters per hour and liters per 100 km; the right scale has a conventional tachometer. Between both scales a monitoring system is located for the most important vehicle functions. When the ignition is turned on, the system is tested automatically. If all is in order, a light signal advises the driver to operate the brake. If there also is no error, a green "OK" signal is indicated. If malfunctions occur they are indicated by a symbol and an acoustic indication. If it is a serious malfunction, an additional red triangle appears, if it is an indication only, the triangle appears in yellow.

Differing technical details of the research car point more or less clearly in the future direction of production model development. The body shows how much can be achieved by detailed improvements on a fundamentally conventional basic form. For the first time means were found for smooth glass-to-metal transitions which can be used in mass production of a top model without excessive costs. The advantages are apparent: markedly reduced air resistance and greatly reduced wind noise, at higher driving speeds.

Precursor of a trend could also be the turbo engine, which has the blower between the suction carburator and engine, and whose character has been modified greatly by "tame" control times for the valve drive. In this connection it is of interest, that Mitsubishi is pursuing a very similar course, as has recently been shown in the new Colt turbo engine which uses an almost similar approach. In both companies engine developers contradict the widespread opinion that turbocharging is recommended only for diesel engines.

[Caption]

The 4-cylinder (Otto) engine equipped with fully electronic performance graph ignition and knocking sensor has 16.1 liter engine displacement and the power 81 kW. Its special feature is an exhaust turbocharger which is located between the carburator and the engine. The operation of this engine with lean mixtures results in extremely economical values for operation and exhaust.



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